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COLONIC AND ANOPROCTOSCOPIC DISEASES

Collective Review

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THIS review of colonic and anoproctoscopic diseases was compiled from the available literature appearing between January 1 and November 1, 1942. The omission of the last two months of 1942 was made imperative by the reviewer's entry into the Armed Forces. As in preceding reviews the subject of proctological disease has been dealt with from a broad point of view. The main aim was to present new information as well as to re-emphasize established principles, concepts, and procedures. A few important articles of the preceding year that were inadvertently omitted from the last review are discussed in the present article. The war interferes with the receipt of foreign medical periodicals and this, to a degree, contributes to the omission of important articles; however, articles from American or foreign periodicals which have been omitted will be included in the succeeding review.

WAR WOUNDS

Owen Richards is credited with having placed abdominal surgery of warfare on its permanent sound footing. He was the first surgeon on the British Front to save a patient with an intestinal wound by surgical means. On March 18, 1915, Richards successfully excised 6 ft. of ileum, perforated in 20 places.

After two and a half years of warfare, Gordon-Taylor (34) took stock of his experience with abdominal war injuries of this "Total War." He also compared and contrasted the war surgery of the abdomen of two periods of time separated by a quarter of a century.

In this war many casualties occur from air bombardment. A considerable percentage results from the direct or indirect effects of "blast" or from crushing force; many of the injuries are non-

penetrating in character. The clinicopathological features found in patients or experimental animals subjected to "blast" consist of hemorrhagic lesions in the various abdominal and other organs. The intestines may show areas of hemorrhage varying from subserosal punctiform spots to large annular extravasations; even rupture of the bowel has been known to occur. The colon of the experimental animal is especially vulnerable to blast; the human large intestine is affected to a lesser degree. Experimentally, it has been observed that when blast phenomena are present in the abdominal viscera pulmonary hemorrhages coexist. And since the lungs are more sensitive to "blast" than the abdominal viscera, the effects of the pulmonary lesion may obscure the abdominal picture, and be the cause of the fatal issue.

In this total war the degree of shock seen among the casualties is far greater than that observed in World War I. As a result of shock alone, many victims with abdominal injuries are beyond operative assistance in spite of frequent transfusions of blood or plasma, the administration of oxygen, and resuscitation therapy.

The "time lag" between the wounding and expert surgical interference plays a most important role in determining the fate of abdominal casualties that are not immediately fatal. To overcome this "time lag," hospitals treating cases of "first urgency" should be very mobile, commensurate with rapid motorized movements of the troops; this is, of course, impossible in rapid retreat.

Gas gangrene has been rarely encountered in this war, which marks a striking contrast to its frequency during World War I. The use of sulfonamides and plaster casts is probably responsible for this turn of events (*Union méd. Canada*, 1942, 71: 11.).

Penetrating wounds. Of the penetrating injuries, those produced by ordinary bullets have fared well. Incendiary bullets are devastating by producing additional destruction and necrosis of tissue through burning; in the case of intestinal involvement resection may be necessary where suture would otherwise have sufficed. Flying glass in air bombardment may enter the abdomen and cut coils of intestine to pieces, or the intestines may hang out of gashes in the abdominal wall. Occasionally peritoneal penetration without visceral involvement occurs.

Hollow viscera may be punctured by metal fragments without penetration of the peritoneal cavity. Indirect violence has produced bowel injury in the last and present wars.

Lesions of the stomach. Of the gastric lesions only dilatation of the stomach will be discussed here. Acute dilatation of the stomach may be a concomitant of penetrating abdominal injuries or a sequel of abdominal operations. This complication is frequently rebellious to treatment and may determine the fatal issue.

Intestinal injuries. Among the lesions of the small bowel there occurred a 47 per cent recovery and among the colonic lacerations the recovery rate was 40 per cent. Because of the lower mortality, suture of the wounds of the small intestine is preferred to resection.

In colonic injuries or perforations too, suture is preferable to resection. This is in agreement with Moorhead's experience at Pearl Harbor (70). In cases of infection, actual or suspected, suture, local sulfonamide chemotherapy, and drainage of the damaged area are best combined with a proximal colostomy. During World War I, colostomy was considered a valuable prophylactic procedure against infection of the lethal retroperitoneal tissues; it is best to perform a colostomy early before the onset of infection. The routine prophylactic use of regional and oral sulfonamide therapy is an excellent adjunct to surgery for colonic injuries.

Gordon-Taylor recommends resection for injuries of the colon under the following circumstances: (1) when the cecum or colon is in a state of infarction; (2) when there is extensive separation of the bowel from its mesocolon or vascular supply, especially when the mesocolon is also the site of a hematoma or is actively bleeding; (3) when the vitality of the bowel is extinguished by a large piece of metal or other fragment hurled with the force of modern high explosives, and (4) when the wound of the large intestine is of such magnitude, or the surgical approach to the part of the colon damaged is associated with such difficulty, as to suggest the formation of an artificial anus as a surgical alternative. In traumatic lesions of the large intestine it is desirable to complete the resections as quickly as possible; the type of anastomosis is a matter of individual choice and experience. The resection should be combined with a temporary proximal colostomy which is considered a useful and, perhaps, a life-saving expedient. Plurisegmental resections of the colon which are successfully performed for nontraumatic conditions are also indicated for injuries of this viscus during war.

Gordon-Taylor knows of only 2 successful exteriorization operations for trauma of the colon performed in this war.

Hernia of the bowel. Hernia of the intestine may vary from protrusion of one or several segments of bowel to complete evisceration, and is a grave

complication. The recovery rate from operation for prolapsed and nonperforated small intestine is about 50 per cent, the mortality being largely determined by concomitant damage. When, however, the small bowel is prolapsed and injured, the mortality rate is about 80 per cent.

Prolapsed and damaged colon carries a grave prognosis although recoveries are known to have been effected by skillful surgery.

The buttock wound. The wound was anterior in 59.6 per cent of the penetrating abdominal wounds, while the wound of entry was on the posterior aspect of the body in 40.4 per cent. In half of the latter, 20 per cent of the total, the wound was in the buttock. The danger of overlooking this portal of entry to the peritoneal cavity was emphasized during the last war and is again being stressed during the present war.

Injuries of the rectum. Gordon-Taylor noted a 52 per cent survival of patients with rectal injuries as compared to a 33 per cent survival in World War I. However, when the urinary bladder was concomitantly injured, only 33 per cent of the patients recovered.

In explosive wounds of the perineum, the anal sphincter and the circumanal ring of skin may be torn away from the surrounding skin and may be drawn high up into the perineal tear. Sulfonamide therapy applied locally should be employed in these wounds. Transverse colostomy in these severe rectal cases is an important expedient (Gordon-Watson).

Gordon-Taylor concluded that in spite of the gravity of the wounds and the frequent association of multiple injuries, approximately 50 per cent of the patients for whom operation is possible will survive. The recovery rate for colonic traumatic injuries is the same, while those for injuries of the small intestine and stomach is higher now than during World War I. Few patients have survived after lengthy resections of the bowel. The inestimable value of liberal transfusions of blood or blood derivatives and of locally and orally administered sulfonamide drugs is stressed.

Sulfonamide Therapy

The rapid and almost continuous development of newer and more effective sulfonamide compounds is favorably reflected in the medical and surgical management of lesions of the colon. Garlock and Seley (*Surgery*, 1939, 5: 787) instituted oral sulfanilamide therapy preoperatively and postoperatively in order to prevent peritonitis and infection of the wounds following colonic surgical procedures. Sulfanilamide exerted a bactericidal effect on the streptococcus hemolyticus which they frequently isolated from the retroperitoneal or retrocolic tissues, the wall of the colon, or from the mucosal surface of the neoplasm. Sulfanilamide was also employed by Lockwood and Ravdin (*Surgery*, 1940, 8: 43) in surgery of the colon because of its bacteriostatic effect on other organisms causing peritonitis.

The introduction of the peritoneal route of administration of sulfanilamide (Dees, J. G.: *Mississippi Doctor*, 1940, 18: 215) made possible the direct local bactericidal action of the drug when placed in contact with intestinal anastomoses or with bacteria-laden tissues. Intraperitoneally placed sulfanilamide augments a cellular defense mechanism similar to that produced by intraperitoneal vaccination; the local therapeutic action is independent of the systemic effect. The occasional occurrence of toxic effects from the peritoneally placed sulfanilamide, such as anemia, leucopenia, and hepatitis (52) have not discouraged the continued careful intraperitoneal administration of the drug. More recently, sulfathiazole, and, at times, sulfadiazine have been used instead of sulfanilamide. Osgood (77) stated that sulfathiazole is more effective than sulfadiazine and is less toxic to cells in the concentrations attained than is sulfanilamide.

In 1940, Marshall and his collaborators (*Bull. Johns Hopkins Hosp.*, 1940, 67: 163) reported their studies of antibacterial sulfanilamide compounds which are water-soluble and yet poorly absorbed from the gastrointestinal tract; because of this it is possible to produce a high concentration of the drugs in the lumen of the intestine and a low concentration in the blood and tissues. Thus, the first intestinal antiseptics of real importance were developed. One of these compounds was designated as sulfaguanidine. This drug, in adequate concentration, significantly reduced the coliform flora of the intact colon; however, no reduction in the number of coliform organisms occurs in the presence of ulcerative lesions of the large bowel (30). Notwithstanding the early claims, further studies disclosed that sulfaguanidine is rapidly absorbed from the small intestine; the low blood concentration is due to the rapid excretion of the drug by the kidneys; the drug is erratic in its action, and it is toxic (31). The occurrence of morbilliform toxicoderma produced by sulfaguanidine (106), and of nausea, vomiting, headache, oliguria, hematuria, and sulfaguanidine crystaluria (19) has been reported.

In 1942, Moore and Miller (69) published the results of their studies on the synthesis of succinylsulfathiazole (sulfasuxidine). The studies of

Poth (80), Poth and his collaborators (81, 82), Firor (30), Lockwood (57), and Saltzstein (87) have shown that this new drug is an ideal intestinal antiseptic because it is poorly absorbed from the alimentary tract and has a strong antibacterial local (intraluminal) action. Sulfasuxidine will cause a drop in the escherichia coli count from an average of 10,000,000 to less than 1,000 organisms per gram of wet stool. Lockwood (57) showed that this drug causes a simultaneous drop in the number of both the coliform and the clostridium group of organisms and a relative increase of the enteric streptococci.

Poth (80) has established the following preoperative preparation of the large intestine:

"The patient is put on a low residue diet and receives succinylsulfathiazole. A dosage of 0.5 Gm. per kilogram of body weight is given during the first day and thereafter 0.25 Gm. per kilogram daily divided into six equal doses and administered at four hour intervals. No enemas or purgatives are used."

Ordinarily the stools will become small in bulk, semifluid, and relatively odorless in the course of three or five days. The patient's abdomen becomes flat and the bowel is free from gross fecal material and gas. When the escherichia-coli count has dropped to 1,000 per gm. of wet feces and the foregoing changes in the stool have taken place, the bowel is properly prepared for surgical procedures. The usual causes for failure are intractable diarrhea and the administration of liquid petrolatum. The intake of the latter should be discontinued, and the diarrhea may be controlled with opiates. Postoperatively, the administration of sulfasuxidine may be resumed as soon as the patient tolerates 30 cc. of water by mouth, and the drug is continued for about a fortnight. This is done because the escherichia-coli reappears rapidly in the stool after the discontinuance of sulfasuxidine.

Less than 5 per cent of the ingested drug appears in the urine. It is excreted by the liver in which hydrolysis occurs. In the blood the free drug is present at levels between 0.5 and 1.5 mgm. of sulfathiazole per 100 cc. whereas the conjugated drug varies between the levels of 1.0 and 2.5 mgm. per 100 cc. The concentration of sulfathiazole in the feces varies from 85 to 200 mgm. per 100 cc. (57). The toxic reactions are mild and occur infrequently. Individuals highly susceptible to sulfathiazole may show toxic manifestations (80).

Quantitative bacteriological studies showed that 93 per cent of the patients will show 1,000 or less escherichia-coli organisms per gm. of wet feces within seven days. Failure to develop these changes may be due to some special condition that interferes with the action of the drug, such as the presence of a blind or short-circuited intestinal loop, an obstruction, or the persistence of severe diarrhea.

The advisability of combining other sulfonamide derivatives with sulfasuxidine in surgery of the colon is now under consideration. Garlock and Seley's studies on the presence of the streptococcus hemolyticus in the bowel and the retroperitoneal and retrocolic spaces make the concomitant use of sulfanilamide or sulfadiazine with sulfasuxidine desirable.

It should be stressed that all investigators emphasized that sulfonamide therapy is an adjunct to and not a substitute for recognized surgical principles, sound surgical judgment, and established operative procedures.

The topical application of the sulfanilamide derivatives in the treatment of infected or potentially infected wounds has gained wide acceptance; there is still, however, considerable controversy regarding the advisability of chemoprophylaxis in clean operative wounds (6, 96). In the management of traumatic civilian and military wounds the sulfonamides are valuable. Gordon-Taylor (34) believes that the rarity with which gas gangrene has been encountered in this war (which is in striking contrast to its frequent occurrence during World War I) is at least in part due to the local use of sulfonamides. Moorhead (70), on the basis of his observations at Pearl Harbor, advised the local application of either sulfanilamide or sulfathiazole to wounds after adequate cleansing and débridement. Abdominal wounds were treated by débridement and the local application of sulfonamides and were left unsutured; a separate incision was made in those cases in which intra-abdominal surgery was indicated. In civilian traumatic wounds, Ferguson and his collaborators (17) employed a microcrystalline sulfathiazole because of its more rapid solution in the wounds and a lesser tendency to cake than the usual sulfathiazole powder. Furthermore, because sulfathiazole is effective against a wider range of organisms and exerts its therapeutic effect over a longer period of time, it is preferred to sulfanilamide. Osgood (77) agreed that sulfathiazole is the drug of choice except in rare cases.

Osgood (77) advised against the employment of local-infiltration anesthesia when local sulfanilamide chemotherapy is contemplated because procaine hydrochloride, and perhaps other local anesthetics, inhibit the action of sulfathiazole.

It should be remembered that procaine, being one of the esters of para-aminobenzoic acid shares its ability to inhibit the bacteriostatic action of the sulfonamides. With regard to the growth of fibroblasts in serum containing sulfathiazole, Reed, Orr, and Anderson (84) showed that during the time when the exudate of the wound is saturated with the drug, fibroblasts will not grow in the lumen of the wound. Normal growth of fibroblasts continues in the tissues in close proximity to the opening of the wound. As the concentration of the drug decreases by absorption to below 100 mgm. per 100 cc., normal growth of the fibroblasts takes place in the entire wounded area.

For the past two years the reviewer (102) has employed sulfonamide chemotherapy topically for postoperative wounds following anorectal operative procedures. A 5 per cent concentration of sulfathiazole or sulfadiazine in a suitable ointment base is applied to the wounds daily or every other day. The wounds so treated present clean and healthy granulation tissue; they heal well with minimal scarring and little discharge or discomfort. The application of sulfonamides in ointment form to postoperative anorectal wounds reduced the time necessary for their effective healing.

The successful employment of sulfanilamide in suppositories in the treatment of 31 unselected cases of anorectal nonsuppurative inflammations is reported by Laufman and Diamond (51). They used suppositories containing sulfanilamide and an anesthetic agent (metycaine) in a water soluble base. As a control, 2 other types of suppositories were used. The suppositories containing sulfanilamide plus metycaine produced rapid subjective relief and the best end-results. The most striking observation was the prompt subsidence of the mucosal and submucosal signs of inflammation as seen proctosigmoidoscopically.

Sulfonamide chemotherapy has been employed with various degrees of success in intestinal infections. Sulfaguanidine is effective in the treatment of acute bacillary dysentery (58). Opper and Hale (76) noted the reappearance of the Flexner bacillus in the stools of 4 of 33 treated patients after the findings had apparently been negative; this experience calls for continued laboratory examinations for several weeks after the disappearance of the organisms from the stools. A similar observation was made by Yannet, Leibovitz, and Deutsch (115) in the treatment of dysentery caused by the bacillus sonnei (Duval) with sulfathiazole. This drug produced rapid clinical recoveries, but there was a significant prolongation of the time required before the rectal cultures became consistently negative. Moreover, relapses occurred following chemotherapy, but not in untreated (control) cases. Kirby and Rantz (47) employed succinylsulfathiazole in the treatment of typhoid and dysentery carriers. They observed the disappearance of dysentery bacilli from the stools of 5 carriers, and the bacilli remained absent for periods varying from thirty to sixty days; typhoid bacilli remained viable in the stools of 3 carriers during two weeks of succinylsulfathiazole therapy.

The value of sulfonamide therapy in chronic ulcerative colitis is under intensive study; the results still appear conflicting.

In amebic dysentery, neoprontosil has been employed in conjunction with amebacides by D'Antoni (21).

As stated elsewhere in the text, sulfonamide chemotherapy for anorectocolonic manifestations of lymphogranuloma venereum, particularly in the absence of strictures, has been uniformly successful.

The effectiveness of sulfanilamide therapy for uncomplicated anal gonorrhea was reported (105). The plan of treatment consists in the oral administration of 1 gm. of the drug every four hours for from 24 to 30 doses; this resulted in a concentration of from 6 to 11 mgm. of free sulfanilamide in each 100 cc. of blood. Thereafter, the dose was reduced to from 3 to 4 gm. daily and was continued for a period of from four to five weeks. Recently, sulfanilamide was superseded by sulfathiazole or sulfadiazine.

The timely military value of the rectal administration of sulfanilamide was again described (99). It was shown that sulfanilamide administered by rectum in solution or suppository is absorbed. The greatest concentration in the blood, indicating better absorption, occurs when solutions are used. The rectal route is safe and may be utilized whenever the oral route cannot be used, but this mode of administration is, of course, not a substitute for the intravenous route when it is desirable to produce a high blood concentration quickly. Ordinarily, the rectal route is very useful under war conditions because, whereas parenteral administration of sulfanilamide demands sterile armamentarium, an aseptic technique, and the services of a physician, rectal administration does not require asepsis and can be entrusted to a trained nurse.

Congenital Anomalies

The congenital malformations of the rectum and anus are discussed by Harken (40). In the sixth week of embryonic life the anogenital groove begins to grow downward, and by the seventh

week it separates the intestinal tract from the urinary system. During the eighth week the anal membrane ruptures. The anal sphincters are derived from the mesenchyme and are independent of the ectodermal and entodermal origins of the anus, rectum, and intestine.

The congenital malformations of the rectum and anus are the result of arrests or defects in the embryological development; these were classified by Ladd and Gross as follows: (1) incomplete rupture of the anal membrane or stenosis from 1 to 4 cm. above the anus; (2) imperforate anus, patency interrupted by the anal membrane only; (3) imperforate anus with an incomplete rectum, the large intestine ending blindly as a pouch within or above the pelvis; and (4) an apparently normal anus and lower rectal pouch but no communication with the blind overlying rectal pouch. The two blind pouches may be separated by a thin membrane or considerable tissue may intervene. Any of these types may occur in male or female patients, but in either sex there is a considerable incidence of fistulas. The most common type of anomaly in either sex is Type 3. The most commonly encountered fistulas are the rectourethral in the male and the rectovaginal in the female.

In Types 2 and 4 in which a thin anal or rectal diaphragm persists, a longitudinal incision or perforation with a hemostat may relieve the obstruction. In Types 3 and 4 in which more intervening tissue than a membrane separates the anal area from the blind end of the rectum, a simple incision or perforation may be dangerous. In these cases the exact position of the rectal pouch must be ascertained; it can be easily determined by clinical and roentgenological studies. When a twenty-four-hour-old or older infant is held in the inverted position, gas accumulates in the rectal pouch and makes roentgenological visualization very simple.

After the exact position of the rectal pouch is determined, a longitudinal incision is made in the raphe and the rectal pouch is mobilized from the surrounding tissue and brought down to the skin margins where it is opened and anchored with interrupted sutures. The perineum is restored by bringing the levator-ani muscles together in front of the rectum. No incontinence should result if the anal sphincter has been cut in only one place. In fact, following the plastic operative procedure, stenosis of the anus may occur, which requires postoperative dilatation. The principles of this plastic procedure vary but little in the presence of rectovesical or rectourethral fistulas.

The most satisfactory therapeutic results may be expected in those patients who have only a thin obstructing diaphragm and in female patients with large rectovaginal fistulas that allow postponement of the operation until the patient is from one to three years old. The delay of operation until the child is between six and eight years old is not advisable. Patients with anorectal malformations suffer a high nonsurgical mortality; this is due partly to the high incidence of associated congenital abnormalities. The concomitant physiological and psychological factors observed in these unfortunate patients justify the institution of heroic surgical procedures in order to reestablish normal anatomical relationships.

Harken produced embryological, gross anatomical, and histological evidence to show that the patients had normal anal sphincters except for atrophy of disuse in the cases in which surgical interference was delayed for a long time. The importance of dividing the sphincter at one point only, as has been stressed and practiced in rectal surgery in general, was again emphasized. An attempt should be made to suture the divided ends of the anal sphincter after the rectum has been anchored in the newly formed anal bed.

Of Harken's 25 cases of malformation of the rectum and anus, 7 of the male patients had associated rectourethral fistulas and 3 of the females had rectovaginal fistulas. Ten are still living; 7 of the 10 are regarded as having clinical cures and have good rectal control.

Neoplastic Disease

Polyps

Mayo (62) has been very persistent in condemning benign polyps because of their malignant potentialities. At the Mayo Clinic, Buie found polyps in 1 of every 35 patients studied proctosigmoidoscopically, while the roentgenologists discovered polyps in 1 of every 55 patients of whom roentgenograms of the colon were made with a contrast medium. Cromar's investigation on the significance of the submucosal aggregations of lymphoid tissue is briefly reviewed; these lymphoid cells may get there to serve a protective function, or are found there in the process of being eliminated after they have run their life course. These lymph conglomerations may interfere with the proliferative changes in the neighboring epithelial and glandular cells and may produce follicle and cystic formations which may be forced into the lumen of the bowel as polyps. The development of either sessile or pedunculated bases is to a large degree dependent on mechanical factors (muscular contraction) and on the connective tissue replacing lymphoid tissue at the base or in the core. Such polyps are known

as "benign adenomas" until malignant degeneration takes place. Of interest in this connection is Gruenwald's (38) study of 5 cases of circumscribed hyperplasia of histologically normal lymphoid tissue in the intestinal tract; these benign hyperplasias of lymphoid tissue seem to occur more frequently than is usually appreciated. The appendix and the rectum are the sites of large accumulations of lymphoid follicles. It should be recalled from the study of comparative anatomy that in the rectum, as in the appendix, lymphoid tissue is accumulated in many species of mammals, especially in the ruminants; hence, the belief that the rectum has a disposition to develop lymph follicles. The formation of these lymphoid structures in the digestive tract requires a certain disposition and also a stimulation of the involved tissues. The importance of either or both of these factors may vary in individual cases.

There apparently are two important factors that may determine transformation of a benign polyp into malignancy: (1) the degree of individual tendency toward such a development which is as yet not determinable, and (2) the duration of repeated chemical and mechanical irritation. It follows that because of unavoidable trauma, the risk that a colonic polyp may become malignant is increased, especially in the presence of a familial history of malignancy and when it is intestinal.

In another study, Mayo and Schlicke (64) analyzed the autopsy records of 334 patients who had died with primary carcinoma of the colon or rectum. Polyps, in addition to the primary lesion, were found in 34 per cent (114 patients); in 14 per cent of these, the polyps had already undergone malignant degeneration. Further analysis of the original group of 334 cases disclosed that 131 patients who had undergone successful resections of the colon or rectum and in whom a good result had been anticipated by the surgeon had died within less than three weeks after operation. Remaining polyps were found at post-mortem examination in 49 of these patients (37 per cent); and it may reasonably be assumed that no change relative to the colonic polyp had taken place within the short interval of time between operation and death.

Among a control group of 100 patients who had died after operative procedures performed for conditions other than malignancy, only 16 instances of colonic polyps were found; 8 of these were malignant.

The distribution of 70 polyps of the large bowel found at autopsy after the performance of surgical procedures was as follows: 10 in the cecum; 7 in the ascending colon; 10 in the transverse colon; 8 in the descending colon; 20 in the sigmoid, and 15 in the rectum (62).

These studies show that colonic polyps should always be eliminated and that a continued preoperative and postoperative search for polyps should be made in every patient in whom one or more polyps or a frank malignancy is found. A patient may be cured by the extirpation of a malignant colonic lesion only to die from another that may arise later from an unsuspected polyp.

Brust (13) encountered more than 5 per cent of patients with colonic polyps in a series of about 4,000 patients examined proctosigmoidoscopically. The small polyps rarely produced symptoms; however, they were destroyed by fulguration because of their malignant potentialities. Brust employs fulguration using the unipolar electrode and he repeats this procedure whenever indicated. For the very vascular lesions a combination of radium and fulguration is advised; radium is applied to the treated area at the conclusion of fulguration. Lesions below the peritoneal reflection are treated in the office while those above the peritoneal reflection are treated in the hospital. Fulguration with unipolar electrodes is preferred to the electric snare because of the occurrence of alarming hemorrhages in 2 patients following the excision of polyps with the electric snare. Polyps situated above the reach of the sigmoidoscope are treated by colotomy if they bleed actively, if they are 2 cm. in diameter, or if they grow (as observed on repeated roentgenographic examination). Brust apparently hesitates to advise a transcolic procedure for the removal of the small polyp that is accidentally discovered. Of course, it is known that intestinal polyps may remain benign for a long time but can they be trusted to do so? (David).

FAMILIAL POLYPOSIS

Falk (26) briefly reviewed the literature pertaining to this lesion, and reported his experiences with a family of 7 children, 6 of whom were found to have polyposis (85.7 per cent). Their father died at the age of forty-eight of carcinoma of the rectum after a twenty-five-year history suggestive of multiple polyposis; the paternal grandfather died at thirty of "cholera morbus." Malignant degeneration had taken place in 3 patients. It should be pointed out that for some unknown reason these people are peculiarly nonco-operative in the investigation of familial involvement and it requires much tact, patience, and ingenuity to obtain a good family history.

Vanzant (108) reported 2 cases of hereditary diffuse polyposis of the colon which were empirically treated with high-voltage roentgen radiation. Roentgen therapy afforded symptomatic relief and produced a diminution in size and number of polyps.

An interesting case of carcinomatous sigmoidovesical fistula associated with multiple polypoid disease of the colon was reported by Mayo (63). This case demonstrated that at least some sigmoidovesical fistulas caused by a malignant process are operable and that multiple polyposis requires radical surgical procedures, but that in selected cases a successful ileosigmoidostomy or ileoproctostomy can be performed after the rectal polyps have been destroyed by fulguration.

ADENOCARCINOMA

Braund and Binkley (10) stated that early diagnosis of rectal cancer has not paralleled the therapeutic progress made during the past twenty-five years. A study of 108 unselected patients showed that a physician was not consulted before an average of eight and nine-tenths months had elapsed since the onset of symptoms such as bleeding, constipation, diarrhea, and pain. In 25 of 100 patients referred by their family physician the lesion was diagnosed without undue delay; these were seen within one month after the first visit. In 75 patients there was an additional delay of nine and nine-tenths months. During this delay the patients received inadequate or improper therapy. In 20 patients a rectal examination had not been made at all, and 37 had had a digital examination which should have been sufficient to make a tentative diagnosis had it been expertly performed. More than 90 per cent of the rectal neoplasms were within the reach of the examining finger. Thirty-four patients had received a proctoscopic investigation, but in many instances this examination was delayed until the disease was far advanced. A biopsy had been performed in only 11 of the 100 patients. Forty-six of these patients consulted from 2 to 5 physicians before they were referred to the clinic. This shopping around for medical care is considered evidence of the patients' dissatisfaction with or failure to improve under the prescribed treatment; in a few instances it was the direct result of being advised that an operation was imperative. The experiences of every surgeon dealing with cancer of the rectum parallel those described by Braund and Binkley. The responsibility for an early diagnosis of cancer of the rectum still rests with the general practitioner. Shearburn (90) concurs in this and advocates a complete proctosigmoidoscopic examination at the earliest opportunity for the patient of any age who reports a change in the bowel habits and/or blood or mucus in the stools. The treatment of hemorrhoids without a preliminary sigmoidoscopic investigation is also condemned.

Brittain (12) stated that blood in the stool and changes in the bowel habit occur more frequently in malignancies of the left than of the right colon. He advocates surgical exploration when roentgenographic and other studies are normal but when symptoms suggest the presence of a neoplasm. Brittain put the responsibility for late diagnosis of cancer of the colon at the door of the patient and his first consulted physician. Some physicians are "too busy, some lack an interest in or have an aversion for all rectal disease, while others place sole reliance on x-ray, still others discontinue further investigation as soon as some benign lesion, such as hemorrhoids, is detected."

A plea for the inclusion of a digital exploration of the rectum in every physical examination was made by Walker and Mantz (109).

Metabolic studies. An important article dealing with the metabolic studies in patients suffering from cancer of the gastrointestinal tract is that of Abels and his collaborators (1). They have demonstrated that 85 per cent of the patients suffering from carcinoma of the gastrointestinal system had low plasma levels of Vitamin A, and these abnormally low levels were ascribed either to an inability of the liver to store or to distribute Vitamin A properly. The hepatic function of four groups of individuals was investigated: (1) normal adults; (2) patients suffering from atrophic gastritis and leucoplakia of the oral mucous membrane; (3) patients suffering from carcinoma of the gastrointestinal system, and (4) persons whose neoplasm had been eradicated by operation. The ability of the liver to synthetize, store, conjugate, and excrete metabolites was studied by performing the following determinations: (1) plasma prothrombin; (2) serum bilirubin; (3) serum proteins; (4) Vitamin A; (5) urinary excretion of glucuronates; (6) mean corpuscular volume of erythrocytes; (7) urinary and fecal excretion of urobilinogen, and (8) serum cholesterol and cholesterol esters. These investigations revealed (1) a high incidence of hepatic dysfunction in patients suffering from carcinoma of the gastrointestinal tract, and (2) a considerably lower incidence of liver dysfunction in persons whose neoplasm was successfully removed by operation. It was pertinently pointed out that delayed healing of wounds, refractory anemia, hemolytic reactions to transfusions, hypoproteinemia, and hypo-

prothrombinemia may be associated with or caused by hepatic insufficiency.

Metastatic spread. The lymphatic and venous routes of metastases of carcinoma of the rectum were the subject of an important article by Grinnell (37). The other two routes of spread, namely, direct extension and peritoneal transplantation were omitted from the present discussion. Seventy-five specimens of the rectum and rectosigmoid were cleared by the modified Spalteholtz technique. Lymphatic metastasis was found in 41, or 55 per cent, of the specimens. Significant intramural lymphatic spread was not observed. The main extramural lymphatic spread occurred upward along the superior hemorrhoidal vessels; it tended to remain localized and to extend slowly in most cases. Hence high ligation and division of the superior hemorrhoidal blood vessels, and the radical removal of the mesentery and the high-lying lymph glands should be done by means of the Miles type of combined abdominoperineal resection of the rectum. Only 4, or 24 per cent, of Grinnell's 17 patients having tumors below the peritoneal reflection with nodal metastasis could have had adequate removal of the involved nodes by perineal excision. Hence, perineal excision is regarded as an inadequate operation even for carcinomas situated below the pelvic peritoneum. In Grinnell's series, there was only 1 instance of lateral lymphatic spread along the middle hemorrhoidal vessels and only 1 case of downward lymphatic spread. Lateral and downward lymphatic spreads occur rarely and only by means of the retrograde flow when the high-lying lymph nodes are blocked. The rare occurrence of downward extension suggests that anterior abdominal resection with ligation of the superior hemorrhoidal vessels may have a wider field of usefulness for tumors near the rectosigmoid. Metastasis to the paracolic nodes was not found in any of the cleared specimens. One case, however, showed clinical evidence of extension along this route following operation; metastasis to the paracolic nodes may occur in patients who are apparently beyond operative cure. The incidence of nodal metastasis was found to be 18 per cent higher in the completely annular tumors than in the partially annular; no relationship could be demonstrated between the square area of the tumor and the frequency of metastasis. Evidence of blood-vessel invasion was discernible in 36 per cent of 75 specimens of carcinoma of the rectum and in 41 per cent of a combined group of 162 colonic and rectal neoplasms. The incidence of blood-vessel invasion was 4 times as great in Grade III as in Grade I tumors, being 100 per cent in the Grade III tumors. Patients with visceral metastases showed a higher incidence of Grade III tumors than did the unselected cases. Twenty-seven, or 90 per cent, of the 30 cases with visceral metastasis showed blood-vessel invasion. Failure to find local blood-vessel invasion is strong evidence that no visceral metastasis exists.

Kay (46) compared the gross and microscopic characteristics of carcinoma of the gastrointestinal tract with the incidence of regional lymph-node metastases. The sessile tumors had a much greater tendency to metastasize than the polypoid new growths. In the polypoid group there was an incidence of metastases of 57.5 per cent in the colon and of 80.9 per cent in the rectum, while in the sessile group there was an incidence of metastases of 83.3 per cent in the colon and of 80.9 per cent in the rectum. There was no relation between the size of the neoplasm and the presence of metastases. The dictum, "The more anaplastic the tumor the higher the incidence of lymphatic metastases," was confirmed. Neoplasms in the younger age groups appear to have a higher incidence of metastases. The incidence of lymphatic metastases was 60 per cent in the colonic group and 64.2 per cent in the rectal series. An average of 52 nodes was isolated from the colonic specimens and of 67 from the rectal specimens.

Metastasis to the left supraclavicular space (Virchow's lymph node) from adenocarcinoma of the rectosigmoid was reported by Greenfield (36); an undifferentiated carcinoma of the supraclavicular node in a thirteen-year-old girl with adenocarcinoma of the rectum was reported by Oosting (75). An instance of metastasis to the humerus was reported by Weston (112).

Treatment. Mayo and Schlicke (65) agree with Gabriel that "among the great variety of operations possible, the operation of choice should be the most radical one that can be performed with reasonable safety." In their opinion, the one-stage abdominoperineal resection (Miles) offers many patients with carcinoma of the rectum, rectosigmoid, or lower portion of the sigmoid their best prospect of cure. Mayo carries out this procedure in 60 per cent of the cases in which resection is performed. Age in itself is not necessarily an influencing factor in the selection of cases. The operation is performed with greater ease in women because the female pelvis is larger. The asthenic individual with a deep, narrow pelvis may present technical difficulties. The obese person is a poor risk by virtue of the faulty metabolism and lowered resistance; both carcinoma

and infection spread rapidly in adipose tissue, and its healing qualities are notoriously poor. At operation, exposure is difficult and the palpation of lymph glands and blood vessels is uncertain. David and Gilchrist (23) do not consider adiposity a contraindication to operation although the added risk of intra-abdominal procedures in obese persons is well known. Mayo has contended that the ability of the surgeon to detect and evaluate liver metastases is accurate. In the presence of liver metastasis, resection of the primary tumor is justified if this will offer the patient a considerable period of comfortable existence. Rosser (85) does not regard liver metastasis as a bar to resection of primary colonic tumors. Rankin (83) states that it is difficult to make a decision as to operability when the rectal lesion is operable and liver metastases exist. The operation, he admits, is formidable even in the hands of expert surgeons; the convalescence is long, and the mortality is higher. However, since death from hepatic cancer is more comfortable than from an obstructing, locally spreading rectal cancer, resection in the presence of hepatic metastasis is frequently justified, but it should not be performed routinely. David and Gilchrist (23) are not impressed with the soundness of a radical resection of the primary rectal lesion in the presence of liver metastasis because of the prolonged convalescence following operation coupled with an average life expectancy of only ten months. These objections do not apply when one or more small nodules are present in the liver. David and Gilchrist have extended the operability to the point of removal of portions of adjacent adherent, involved structures, such as the prostate and small bowel. Bowers (8) recorded his favorable experience with resection of the colon and urinary bladder when the latter was involved by the colonic neoplasm through extension. When polyps are found in the vicinity of the rectal neoplasm, Mayo and Schlicke (65) advise resection of considerable adjacent bowel, which can best be accomplished by the combined abdominoperineal resection. The tumor-forming propensity of the mucosa adjacent to rectal carcinoma is given as an added reason for wide excision of the adjacent bowel.

Mayo and Schlicke (65) believe that the one-stage combined abdominoperineal resection of the rectum should not require more than from one hour to an hour and twenty minutes because they fear that death from shock alone will result if too long a time is spent in its performance. This is in agreement with Johnson and Lombard (*N. England J. M.*, 1941, 224: 759) who believe that the operative mortality of patients with cancer in general is influenced to a great extent by the length of the operation.

Jones (43) in a very comprehensive study discussed the complications of one-stage abdominoperineal resection of the rectum for carcinoma as observed in a series of over 500 patients. Parotitis occurs in about 5 per cent of the cases and seems to run in cycles, months elapsing between the attacks in a few cases. The mild cases subside with heat alone; early incision and drainage through the capsule of the gland is reserved for the progressive cases. Suppuration occurs in a small number of cases. The incidence of pulmonary complications has a definite relationship to the postoperative incidence of wound infection. By reduction of infection of the wounds through the employment of interrupted alloy-steel-wire sutures in the closure of the abdominal wounds, the incidence of pneumonia has dropped. Atelectasis occurs rarely. At the appearance of the first signs of atelectasis, intravenous sodium sulfathiazole or sodium sulfadiazine is administered promptly. Fatal pulmonary embolism, in most instances, occurred ten days after operation. Jones presumes that the embolus is dislodged from the pelvic or iliac veins as not a single case of femoral phlebitis with its sequelae has been observed by him. In former years peritonitis occurred frequently and was almost always associated with infected wounds, which suggested that the former was secondary to the latter. Since the institution of alloy-steel-wire sutures the incidence of wound infection has dropped from 28 to 0.85 per cent. Jones never advocated the use of intraperitoneal vaccine nor has he employed sulfanilamide intraperitoneally. Sulfanilamide has, however, been used in a few cases in the posterior wound. The care of colostomy is important. The colostomy is brought to the midline incision; it is occasionally opened at the conclusion of the operation, and very frequently during the first twenty-four hours if there is any distention of the loop. The bowel should never be sutured to the peritoneum, fascia, or skin; this practice invites infection. Diverticulosis is frequently associated with these cases and rupture of a diverticulum may occur as a result of distention of a loop for several days. Paralytic ileus is uncommon; it is usually produced by a mild peritonitis or a plastic exudate due to a number of causes. The use of the Miller-Abbot tube is advised. Death from hemorrhage occurs but rarely. Postoperative hemorrhage during the first twenty-four hours is usually due to oozing from vessels over the prostate or the upper part of the vagina and is controlled by packing. Ligation of the inferior mesenteric and the middle hemor-

rhoidal arteries in cases of arteriosclerosis makes the operation "hemorrhage-proof." Shock has not been observed in this large series of patients; spinal anesthesia and blood transfusions are considered important factors in the prevention of shock. Spinal anesthesia is employed routinely except when the patient is elderly and has arteriosclerosis and hypotension. A transfusion of blood is given during the progress of the operation. Prolonged hypotension postoperatively may cause cardiopulmonary or renal-insufficiency complications. Prolapse of a loop of bowel through the pelvic floor has not occurred; postoperative perineal hernia occurred only once. Late obstruction due to kinking of the ileum over the pelvic floor by an adhesion also occurred once. New growths in the remaining large bowel (1 in the cecum, 1 in the transverse colon, and 1 in the descending colon) were observed 3 times, more than two years postoperatively in each instance.

Urogenital complications of malignant disease of the rectum. Mullen and Lestrohan (71) pointed out that urinary complications may occur either as a result of the neoplasm in the rectum or as a result of proctectomy. These complications are seldom, if ever, seen after abdominal procedures; they invariably follow the perineal operative procedures. Furthermore, it has been observed that some patients do and others do not develop urinary disability following the same type of surgical procedure performed by the same operator. Latent disease in the urinary system (prostatic hypertrophy, infection) may play an important role but is usually overshadowed by the seriousness of the rectal neoplasm.

The postoperative urinary complications are believed to be due to one or a combination of four factors: (1) direct, intentional or unintentional, injury to the urinary system; (2) loss of supports of the bladder in the destruction of the pelvic floor which results in the sagging of the bladder into the posterior, infected dead space; (3) postoperative catheterization with almost inevitable infection, and (4) injury to the vesical nerve supply.

The anatomical relationship of the intricate nerve supply and the posterior pelvic fascial planes may be observed as follows:

"If the coccyx is excised one comes down on to a thick fascial layer that is made up of the endopelvic fascia and the periosteum. A vertical incision through this discloses a second layer that is usually considered to be the fascia propria of the rectum, but if a second vertical incision is very carefully made in this sheet, it will be found to be made up of two layers of fascia, with a definite cleavage plane between them. It is in this plane that the dissection should be carried laterally, in which event the pelvic splanchnic is pushed aside with the fascia and only those branches ending in the rectum are destroyed. When the dissection is carried laterally outside of this second, or middle layer, in the cleavage plane first encountered, the nerves are torn off the sacral foraminae before the fascia can be mobilized with resulting bladder paralysis of lesser or greater degree. When the dissection is made in the proper plane, the nerves can be seen passing toward the bladder, like a cable across the dead space. It is probable that failure to damage the nerve supply in all cases is simply due to the fact that one has inadvertently entered the proper cleavage plane."

Uroinfection is a frequent, if not a constant, accompaniment of the neural vesical disturbances or of the sagging of the bladder posteriorly. In some cases at least urogenital infection should be interrelated with the neuromuscular vesical physiology. According to Jones (43), infection caused by the escherichia coli and staphylococcus albus responds to sulfathiazole. The streptococcus fecalis is controlled by sulfathiazole or mandelic acid. In the reviewer's experience, mandelic acid is more effective when chemically combined with methenamine-mandelamine. Combinations of the escherichia coli and streptococcus fecalis respond better to sulfathiazole than to mandelic acid. Sulfanilamide is effective against the proteus vulgaris, while sulfathiazole is preferable for other urea-splitting organisms.

The question of catheterization is still unsolved; the cardinal principle is to avoid overdistention of the bladder. The incidence of spontaneous postoperative urination varies from 15 to 33 per cent (43, 71). Jones introduces a urethral catheter into the bladder before operation and allows it to remain for twenty-four hours. The bladder is then catheterized intermittently until the patient voids spontaneously. When the residual urine is 200 cc. or less, the patient is catheterized once daily until the residual urine is 100 cc. or less on 2 consecutive occasions. About 90 per cent of the patients void with a residual urine of 100 cc. or less before leaving the hospital (43). The retention catheter and mecholyl are reserved for the patients who have a constant and high residual urine or who cannot void spontaneously. Whenever indwelling catheters are used tidal drainage should be instituted (71). If this form of therapy fails, cystoscopic examination should be instituted to determine the status of the vesical neck and the advisability of a transurethral resection. In the presence of urinary

symptoms, cystoscopy and transurethral resection are best carried out before operation in order to avoid postoperative urinary complications.

Lipton, Beaser, and Altschule (56) have studied the action of furmethide (furfuryl-trimethylammonium iodide) on the atonic bladder of 3 patients after a one-stage abdominoperineal resection for cancer of the rectum. Its effect was to increase tone and restore atony to or toward normal. Furmethide effectively controlled the dysfunction of the bladder in the 3 patients studied. In the clinical use of the drug, it is possible to find an effective dose that does not produce side effects, such as salivation, sweating, a feeling of warmth, and a desire to void.

Anuria as a complication after operation on the colon and rectum has been reported (66, 71). Mayo and Schlicke (66) recorded 4 cases of anuria with recovery; 2 were apparently due to post-traumatic edema and crystalluria as well as to an inadequate intake of fluids; 1 was produced by sulfonamide chemotherapy; and the last was caused by dehydration. They also reported a fatal case of intrarenal anuria.

Impotence occurs in about 95 per cent of the patients who undergo an abdominoperineal resection. Impotence is probably caused by the destruction of the sympathetic nerves, including the nervi erigentes. Epididymitis is an uncommon complication (43).

Anterior resection. Dunphy (25) described a satisfactory technique of anterior resection of the rectosigmoid for cancer. Emphasis is placed on the use of this procedure to extend the scope of resection in cases of lesions of the lower part of the sigmoid rather than to limit the areas of resection in cases of cancer of the upper part of the rectum. The precise indications for anterior resection as opposed to abdominoperineal resection must await clarification on the basis of pathological study of resected specimens and follow-up data obtained over a long period of time. Grinnell's (37) studies on the lymphatic spread, discussed elsewhere in this review, tend to support the premise of anterior resection.

Colostomy. Mayo (61) described a new technique of performing abdominal colostomy which is believed to prevent prolapse, to eliminate spilling of the feces from the upper into the lower segment of the bowel, and to develop semimuscular sphincter action. Lahey (50) pertinently stated that many of the criticisms made of colostomy with the lesion unremoved do not apply when the neoplasm is extirpated. Most of the unpleasant symptoms that are ascribed to the colostomy are in reality attributable to the unremoved neoplasm and not to the colostomy itself. Standard (92) suggested that the patient who does not accept an artificial abdominal anus because of psychological reasons should be told that colostomy is a six months' matter and that the advisability of closure is to be decided at that time. Usually at the end of six months the patient has become satisfactorily accustomed to it and no longer presents a special problem.

Lahey believes that the surgeon may place the colostomy anywhere on the abdominal wall, but that it is essential to have the level of the mucosa well above the skin; there are no other "tricks" concerning the performance of a colostomy. Hirschman (41) advocates the umbilicus as the proper site for the permanent stoma. Martin (60) has recently observed 3 cases of obstruction following umbilical colostomy and has therefore been deterred from employing this site for colostomy. Jones (44) believes that the colostomy should be put where it fits best and utilizing the one-stage abdominoperineal procedure, he prefers to place the stoma in the midline incision about half way between the symphysis and the umbilicus.

Hirschman (41) believes that the "perineal stoma has retained a definite position in the list of operations at our disposal." Grinnell (37), on the basis of his pathological studies of cleared specimens, regards perineal resection as a completely inadequate operation. Martin (60) believes that perineal resection of the rectum without a preliminary colostomy or exploratory laparotomy is rarely or never necessary; he regards the perineum as an unsatisfactory site for colostomy. Hamilton (39), reviewing 52 so-called Lynch (perineal) operations, found that complications developed in the stoma of 16 patients. In 6 cases prolapse of the rectum occurred and necessitated cuff amputation, and in 10 constriction ensued; this was sufficiently severe to necessitate a plastic operation in 5 cases.

The care of abdominal colostomy is simple in most cases. A moderately constipating diet plus regulation of bowel function by colonic irrigations performed daily or every two to sometimes three days is all that is needed (50, 94). One of the reviewer's intelligent patients described his technique of making enemas which follows verbatim:

"I have experimented with various quantities of water and high and low enemas and have finally settled down to the low enema and the following procedure: I use a 2 quart enema can with tube, a glass connecting tube, an enema tube, lubricating jelly, a hospital size male urinal and an enema dish without handle or protruding

edge of about a quart capacity (this for easy handling and holding under the new anus). I use one and one-half to 2 quarts of lukewarm water. Before using, I run off some of the water so as to get the air out of the tube. The enema tube is always lubricated before use. The enema is taken at approximately the same time daily, about a half hour after breakfast. I sit on a towel covered stool in front of the bowl. Urinal and pan are handy to my right on the floor, or better, on a small stand. The enema can is suspended within reach. I place a towel in my lap to catch any spills, place the pan under the new anus and support it in position with my thighs, and start the enema. Initial backflow is caught in the pan, if there is any. I regulate the flow with one hand and keep the enema tube in position with the other." This procedure has been found valuable by other patients.

CANCER OF THE COLON

Brindley (11) stated that cancer of the colon is a local disease for months and that metastasis occurs relatively late. The size and fixation of the tumor is frequently due to an inflammatory process. The determining factors of this disease are: (1) the histological pattern; (2) the degree of activity of the malignant cell; (3) the depth of muscle penetration, and (4) gland metastasis. Surgical procedures were carried out in 150, or 79 per cent, of 190 patients studied. A radical resection was carried out in 100 patients with a mortality of 17 per cent. The surgical mortality of primary resections was 4 times as high as that of multiple stage procedures. Exteriorization or other graded procedures are advocated by Rosser (85) for the extirpation of most operable colonic tumors. In the presence of obstructive symptoms, radical one-stage procedures are definitely contraindicated. Thirty-one of his 50 cases were operable; 3 deaths occurred among the cases in which the neoplasm was resected and 2 other patients died while they were being prepared for resection. Morbidity associated with the exteriorization operation may be decreased by the prompt release of the colostomy stoma, the prompt application and removal of the crushing clamps, and prompt surgical closure of the resultant fistula. The resulting fistula in the sigmoid should be allowed to carry along sufficiently long to permit an opportunity for closure without additional surgical procedures. Because obstruction by colonic tumors is not well tolerated (decompression with the aid of the Miller-Abbott tube or enemas is frequently ineffective), multiple procedures will continue to be indicated in these cases. In the lowest terminal portion of the colon, acute and chronic obstruction is well tolerated (mechanical decompression from below is effective), which justifies the employment of one-stage procedures.

The complications that may follow the crushing of a colostomy spur are instructively discussed by Mayo and Schlicke (67). The following were discussed in detail with case reports: (1) acute perforation of the bowel with generalized peritonitis; (2) injury to the jejunum and ileum resulting in jejunocolic or ileocolic fistulas; (3) injury to the ureter with the formation of a ureterosigmoidal fistula, and (4) hemorrhage necessitating the transfusion of blood and packing. These complications may occur shortly after the application of the enterotome, at any time while it is in position, or not until a variable time after the clamp came off. Care in the construction of the spur at the time of the original operation, care in the application of the crushing instrument, and proper management of the patient during convalescence will help to avoid complications. Hasty tightening or premature removal of the entertome is to be avoided; the crushing device should be protected from traumatizing influences. Pemberton and Black (79) described their favorable experiences with delayed closure of colostomy wounds. The term "delayed closure" as applied to wounds denotes that the wound is packed widely open for a period of time before it is closed, i.e., the fascia is usually closed tightly and only the skin and subcutaneous tissues are packed open. The technique in brief is as follows:

After the segment of the bowel containing the colostomy has been freed from the body wall, the scar tissue around the opening in the bowel is excised and the opening is closed transversely to the long axis of the bowel with two rows of surgical gut sutures. The fascia is approximated above the sutured bowel with interrupted surgical gut sutures. Silkworm-gut sutures are then placed: a generous bite is taken through the skin on one side, the needle is reversed to pick up the fascia, and is then continued in the original direction to pick up the skin on the other edge of the incision. Usually 3 such sutures are sufficient. These silkworm-gut sutures are held loosely on each side of the wound by hemostats, and the skin and subcutaneous tissues are packed open with iodoform gauze. In forty-eight hours the gauze pack is removed and the silkworm-gut sutures are tied sufficiently tight to approximate the edges of the skin. Later on the local use of 5 gm. of either sulfanilamide or sulfathiazole was added. The employment of sulfonamides has

thus far not affected the healing of the wound, but this practise is being continued. Extensive, indolent, subcutaneous abscesses that had occasionally been noted following the primary closure of a colostomy, especially after fecal drainage had occurred, have not been observed following delayed closure of colostomy wounds.

LEIOMYOMAS

Golden and Stout (31) presented an important and complete study of the smooth-muscle tumors occurring in the gastrointestinal tract and the retroperitoneal tissues. The terms leiomyoma and malignant leiomyoma are preferred. The classification of these tumors into benign and malignant types is difficult because frequently the poorly differentiated tumors which possess the histological criteria of malignancy lack the clinical evidence, while occasionally a well differentiated tumor has grown by infiltration and has metastasized; the role of the biological behavior of the tumor must be reckoned with. The treatment is always surgical and in most cases it must be radical in scope. The anatomical site of the lesion and its histological pattern determine the prognosis. Tumors of the colon, and also of the stomach, jejunum, and ileum, are restrained for a long time by the barrier of the peritoneum so they lend themselves to complete and successful removal. The anatomical peculiarities of the retroperitoneum, duodenum, and rectum almost preclude complete removal of their tumors and hence favor recurrences following surgical attempts at removal.

MELANOMAS

Goldman and Robillard (32) state that melanomas of the intestinal tract constitute from 2 to 3 per cent of all melanomas and are most frequently found in the rectum. They reported a case of malignant melanoma of the rectum, and reviewed the origin and significance of melanin in malignant tumors.

LIPOMAS

Manheim and Peskin (59) reported an interesting case of lipoma of the midsigmoid which was spontaneously expelled. Lipomas constitute a small percentage of benign intestinal tumors. These lesions are usually diagnosed as malignant neoplasms until the specimen is examined histologically.

MALIGNANT NEOPLASMS IN JUVENILES

The incidence of malignant neoplasms of the rectum in children has been computed at 4 per cent of all growths (4). It is believed that the active tissues of young people, instead of resisting invasion of cancer invite its spread. Oosting (75) reported 1 case of adenocarcinoma with widespread metastasis in a thirteen-year-old girl and 1 case of adenocarcinoma in a rectal polyp in an eight-year-old boy. Bacon, Wolfe, and Archambault (4) also reported an adenocarcinoma in a polyp in a boy of four years and seven months; this child is free from symptoms or recurrence after more than five years following the extirpation of the polyp. In Oosting's case, the polyp was cut off and the base was fulgurated. As in adults, it is highly desirable to remove these polyps close to the base and to fulgurate the base thoroughly. Serial sections of the extirpated polyps should be made and if malignant cells are found near or at the base of the polyp a radical operation may be indicated (Waldron, G. W.: *Texas J. M.*, 1941, 37: 13, and Hayes, H.T., and Burr, H. B.: *South. M.J.*, 1941, 34: 806). Bacon, Wolfe, and Archambault (4) also reported a boy aged three years and eight months who had a reticulum-cell sarcoma and who survived nineteen months after unsuccessful surgical attempts at complete removal and postoperative irradiation.

DIVERTICULITIS

Smithwick (91) discussed his experiences with the surgical management of diverticulitis of the sigmoid. Seventy-five per cent of the diverticula occur in the sigmoid colon while the rectum contains only 2.4 per cent. Since complications of diverticulosis occur infrequently above the upper level of the sigmoid, it is reasoned that factors particularly affecting the sigmoid, such as the narrow lumen, stasis, and the presence of solid fecal material play an important role. Incidentally, the sigmoid is the most frequent site of malignancy of the colon. It is estimated about 5 per cent of persons aged forty have diverticulosis and that about 1 in 10 patients with diverticulitis requires surgical interference. Resection of the involved segment with re-establishment of continuity of the colon, preceded by a transverse colostomy with a period of delay before resection of from three to six months, is the operation of choice for the severe complicated forms of diverticulitis. If carefully planned, the mortality should be low, serious complications few, and unsatisfactory late results infrequent. The Mikulicz operation is comparatively safe but is occasionally complicated by small-bowel obstruction. However, the late results were satisfactory. The best late results as judged by postoperative roentgenological studies followed the

more extensive resections. Cave (16), however, believes that any type of exteriorization procedure is as complete and safer than resection with end-to-end or side-to-side anastomoses. Cattell (15) advocated delay of operation for diverticulitis with abscess until the abscess points in the left lower quadrant of the abdomen or in the rectum; these abscesses frequently drain spontaneously into the lumen of the bowel. Preliminary transverse colostomy should usually precede colonic resection. When primary resection was performed for diverticulitis because of a mistaken diagnosis of cancer, the mortality was 50 per cent. Berman and Bauer (5) advocate preliminary colostomy followed by extrusion of the affected loop of bowel for extremely extensive involvement when the technical difficulties preclude resection.

Acute Perforations of the Colon

Klingenstein and Tuchman (48) observed 7 cases of acute perforations of the colon which occurred some time after admission of the patient to the hospital. Chronic ulcerative colitis was the underlying cause in 6 cases, while a stercoral ulcer in a huge megacolon was the cause in the seventh case. Shock and collapse supervened very promptly and made operation impossible. Perforations of the colon, especially those associated with chronic ulcerative colitis, are difficult to diagnose because peritoneal irritation is common in this group of patients as a result of deep subperitoneal ulcerations. The prognosis depends on early recognition of the perforation and prompt surgical intervention. The mortality is attributed to underlying constitutional disease and the resultant fecal peritonitis.

Anal Infection

Nesselrod (73) re-emphasized the chain of events which occur in the pathogenesis of anal inflammatory disease. The crypts of Morgagni which may act as a receptacle for infectious intestinal material become infected and in turn infect the anal ducts which open into the anal crypts but lead to anal racemose glandular structures. It should be added that primary infection of these anal glands may also take place with extension of the infection to the surrounding tissues. Nesselrod believes that the lymphatics probably also play an important role in anal infections. Anal infection may produce phlebitis that underlies hemorrhoidal disease.

The perianal manifestations of hidradenitis suppurativa, a chronic inflammatory disease of the skin and subcutaneous tissues affecting parts of skin in which the apocrine sweat glands are situated and which is characterized by the formation of undermining abscesses, sinuses, and ulceration, are discussed by Jackman (42). This lesion must be differentiated from anal fistula, pilonidal cyst, or other sinuses, furunculosis, and nonspecific granuloma. Hidradenitis suppurativa affects adult robust individuals who have a seborrheic type of skin and associated acne. The cause is undetermined, but the lesion is definitely infectious in character. In its early development a solitary abscess may form but in the more advanced stage, burrowing, undermining, and sinus formation occur. Histologically, the apocrine sweat gland is the seat of a primary inflammatory reaction; the infection spreads via the lymphatics and tissue spaces throughout the skin and subcutaneous tissues. The glands may become completely destroyed. The process of burrowing rarely extends to the anal canal, but when it does the site of involvement usually has no relation to the mucocutaneous junction where true anal fistulas originate. In the early stages, incision and drainage of the abscess and irradiation are effective. In the advanced stage, radical excision of the involved tissues to produce a clean superficial wound without overhanging edges is indicated. The denuded areas are treated as a potentially infected wound. When the denuded area is very extensive, skin grafting may be necessary.

Perirectal abscess as a cause of indeterminate fever was studied by Weisel, Wakefield, and Smith (111). In general, involvement of the perirectal tissues in this group of patients was considerably more extensive than is seen in the usual case of perirectal abscess, and yet the usually severe local symptoms and signs were absent. In 5 of the 12 patients studied, urinary symptoms dominated the clinical picture. The correct diagnosis was suspected and confirmed only after repeated physical and, particularly, rectal examinations. This interesting study shows that perirectal suppuration should be thought of in the differential diagnosis of hyperpyrexia of obscure origin. It may be interpolated here that a rapid sedimentation rate of the blood plus tenderness, no matter how trivial, in the perianal region, should suggest an early, obscure anorectal suppuration (Turell, R., and Marino, A.W.M.: *Am. J. Clin. Path.*, 1940, 10: 300).

Abscess and Fistula

Pyogenic. Fansler (27) and Nesselrod (72) have contributed instructive papers dealing with anal abscess and fistula. Both authors stressed the fact that the ordinary anal fistula represents the

final product of the progression of an anal abscess; Nesselrod rightly regards an anal fistula as a chronic anal abscess. The concept established by Buie that anal abscesses begin with infection in a crypt of Morgagni was re-emphasized. Nesselrod favors, but Fansler questions, the etiological role played by the preformed anal ducts and anal glands. It should be recalled that the early anatomical studies of these anal structures were made by Herrmann and Desfosses in 1880 and by Johnson in 1914. In 1917, Pennington revived interest in these structures and pointed out their relation to the genesis of fistula-in-ano; this concept was again stressed by Harris in 1929. In 1933 and again in 1937, Tucker and Hellwig restudied the histopathology of the anal ducts and glands; their work was confirmed by Pope and Gunn. Hill and his associates contributed an instructive scientific exhibit dealing with the subject at the convention of the American Medical Association held in June, 1942, at Atlantic City. The anal ducts empty into the crypts of Morgagni but may lead to racemose multiglandular structures situated in the perianal tissues and may pierce the anal sphincter muscles, especially the internal sphincter. The anal ducts are lined with a columnar epithelium which in branches is cuboidal, and may become natural incubators for bacteria under suitable conditions. Primary infection of these glandular structures may at times be the cause of perianal and perirectal suppurations with subsequent formation of fistulas.

Nesselrod ascribed considerable importance to the surgical spaces about the anorectum of which there are 5; 2 ischioanal, 2 pelviorectal, and 1 retrorectal. The ischioanal are separated from the pelviorectal spaces by the levator-ani muscles. Bochner believes that these fossae or spaces do not heal spontaneously or after simple incision because they are anatomically noncollapsible (7).

The primary openings of true anal fistulas are always found within a crypt of Morgagni regardless of the number of tracts present, and usually follow a definite pattern of arrangement with reference to the anal canal. Salmon and Goodsall have stated that when a secondary opening is situated posteriorly to an imaginary transverse line drawn across the center of the anal orifice, the primary opening is usually in the midline posteriorly and the tract is curved. On the other hand, the external opening of a fistula which is situated anterior to this line will usually have a straight or direct pathway to an anteriorly situated primary opening. Nesselrod, on the basis of previously published anatomical studies, stated that the foregoing follows the definite lymphatic pattern. He had observed that all collecting lymphatic vessels, whether they arise posteriorly, laterally, or anteriorly from the anal network of origin, eventually pass anterolaterally toward the regional lymph nodes; "since the lymphatics play an important role in the spread of infections, it would seem logical to believe that anal fistulas arising in the dentate margin posteriorly would tend to follow the course of the collecting lymphatic vessels, which course, posteriorly and laterally, is curved. By the same reasoning a fistula arising in either of the two anterior quadrants would be likely to follow a fairly direct course to its secondary opening."

Anal and perianal abscess should be drained early and thoroughly. Fansler favors the crucial incision with the removal of skin between the crossed incisions which unroofs the abscess cavity. If, after careful exploration, a fistulous tract is found "below the external sphincter" or if the abscess is small and the tract is "above the external sphincter," the tract is excised. In large abscesses, simple drainage is instituted and a seton is passed through the fistulous pathway which is dealt with at a later date. Anal fistulas of more than one tract are the result of the failure to drain the abscess early. In fistulectomy, the primary opening must be found and all the accessory sinus tracts must be eliminated so that a broad, clean, flat wound without overhanging skin edges results. However, that portion of the tract which contains the internal opening is treated by simple incision. Fansler admits that this is contrary to the practice of other surgeons, which consists of the clean-cut excision of the entire fistulous tract as well as of the adjacent infected tissues. Stress is laid on the individualization of every complicated fistula; no hard and fast rule can be applied to the management of these lesions.

Tuberculous. Goorwitch (33) contributed an instructive article on this subject. He believes that a tuberculous anorectal fistula is one that is either caused or maintained in its chronicity by the tubercle bacillus regardless of the primary etiological organisms. Primary anorectal tuberculosis is extremely rare. The tuberculous nature of the lesion can best be determined by histological examination of the excised specimen. The bacteriological methods of examination (culture, guinea-pig inoculation) of anorectal lesions are reliable only in the patient with a negative sputum as viable and virulent tubercle bacilli are present in the terminal bowel of patients with pulmonary tuberculosis who have positive sputa. Perianal abscesses in the tuberculous patient should be in-

cised and drained early and this should be followed by fistulectomy when chronicity of the lesion is established. One-stage or multiple-stage radical excision of the tract or tracts followed by postoperative meticulous care is advocated. Goorwitch employs the electrosurgical scalpel and infiltration anesthesia. A valid objection may be raised to the use of local infiltration anesthesia in the presence of infection for the excision of infected lesions, such as anal fistulas. Caudal and paravertebral block or low spinal anesthesia is preferable and is definitely safer.

At the Olive View Sanatorium no relationship was observed between the rate of healing and status of the sputum; the average rate of healing was identical in the sputum-positive and sputum-negative groups. Goorwitch believes that "adequate drainage and satisfactory reparative power are of greater importance than the extent of the pulmonary involvement and the sputum status." In support of this view he reports 100 per cent healing of hemorrhoidectomies in patients in whom the incidence of positive sputum was about 50 per cent; the average rate of healing was one month both in the sputum-negative and the sputum-positive patients.

The clinical and anatomical studies conducted by Basunti and Sticoti (*Klin. Wschr.*, 1941, 20: 548) suggest that the perianal tuberculous abscess is probably of hematogenic origin. Their studies confirmed the prevalence of anal fistulas in male patients (12 per cent in men and only 1.6 per cent in women), as well as the frequent occurrence (7.7 per cent) of this anal lesion in pulmonary rather than in extrapulmonary tuberculosis (0.8 per cent). Anal fistulas appear to be more prevalent in subjects suffering from the severe exudative or destructive type of pulmonary tuberculosis than in persons afflicted with the productive form of the pulmonary tuberculous lesion. In the severe types of tuberculosis, multiple anal fistulas with extensive infiltration may be present, while a benign anal lesion is usually discernible in the fibrous form of pulmonary tuberculosis.

Chronic Ulcerative Colitis

Winkelstein and Shwartzman (114) recognize an indeterminate type of ulcerative colitis with an unknown etiology in which escherichia coli may play an important pathogenic role as a secondary invader which may be treated with serum therapy. Twenty-nine recently observed cases as well as 41 previously reported cases—altogether a group of 70 patients—were treated with the concentrated and unconcentrated antitoxic serum prepared according to the principles of the Shwartzman phenomenon. Of the 29 recent patients 20 were greatly benefited, in 2 the results were questionable, and 7 failed to show improvement. In view of the encouraging results, the intramuscular use of concentrated antitoxic bacillus-coli horse serum (Shwartzman) is advocated for severe and intractable indeterminate ulcerative colitis.

Andresen (2) found that food allergy played an etiological role in 66 per cent of his cases of chronic ulcerative colitis. Better results were achieved with the allergic approach than with other procedures. The pathological changes of early ulcerative colitis are identical with those demonstrated in allergy experiments on human beings and on animals. Spasm and hypermotility follow the irritation caused by the allergic reaction in the mucous membrane; ulceration and subsequent secondary infection complete the pathological picture. Eosinophilia was not usually present in the circulating blood. Proctoscopic and roentgen-ray investigations will demonstrate the effect of allergenic foods and the improvement that follows when these foods are eliminated from the diet. Milk was one of the offenders in 84 per cent of the cases and the sole offender in 40 per cent. Wheat, tomato, potato, orange, and egg were also conspicuous offenders. The basic diet given should not contain these common allergens. Additional foods are given as the condition improves. Treatment based on an allergic theory has produced better results than that based on an infective etiology. Other forms of therapy were concomitantly employed. In general, Rowe (86) agrees with Andresen's thesis but cautions that the maintenance of weight and the control of avitaminosis, hypoproteinemia, and anemia are essential. Sulfonamide therapy for the control of secondary infection is also advised. The Mayo Clinic group (93) believes that confines of allergic colitis are poorly defined and the number of such cases is very small. Rowe (86) pertinently remarks that in the intractable cases the study of possible allergy should not delay surgical treatment when it is indicated. Kahn and Bay (45) advocate surgical interference in the chronic intractable cases, in cases presenting progressive extension of the pathological process, in cases showing periods of activity and remission with extension of the disease, and in complications. Total but graded colectomy is the logical procedure because it completely eliminates the diseased colon, results in no permanent damage to the patient, and is attended with a reasonable mortality. Ileostomy is advised by many surgeons in the acute fulminating case before the patient's general condition has been too greatly compromised; this

procedure is no longer advocated in the presence of massive hemorrhages as surgery in this type of case invariably ends fatally. Vitamins C and K and transfusions of blood should be given (Cave).

Amebiasis

Faust (28) has recently estimated that the incidence of amebiasis is probably as high as 20 per cent, or double that of previously accepted estimates. Lewis and Low (55) found an incidence of 21.5 per cent in the Yakima Valley, Washington. D'Antoni (21) believes that while amebic dysentery presents a dramatic clinical picture, nondysenteric amebiasis constitutes the major problem. His study of the incidence of amebic lesions in different bowel levels showed that the lesions occur predominantly in the cecum-appendix and rectum-sigmoid areas. On this basis, D'Antoni classifies amebiasis thusly: (1) asymptomatic, the patient is usually not cognizant of symptoms, with lesions not confined to specific areas (the term "healthy carrier" should be abandoned as it connotes nonpathogenicity); (2) symptomatic, (a) asyndromic, with mild toxemia and vague gastrointestinal irritation, and with lesions usually not confined to specific areas, and (b) syndromic, with symptoms simulating chronic appendicitis, peptic ulcer, and chronic cholecystitis, and with lesions in the cecal area; (3) dysentery (acute or chronic) with symptoms of dysentery and lesions throughout the colon, especially the sigmoid and rectum; (4) hepatitis and liver abscess with fever, pain, and tenderness in the liver area and lesions in the hepatic tissue; and (5) involvement of the other organs—abscess of lung, brain, kidney, and amebiasis cutis. D'Antoni stressed the necessity of treatment for all patients as they present a danger to themselves and the community. The dosages, methods of administration, efficacies, toxicities, and contraindications of the various useful drugs are given in great detail. Ochsner and DeBakey (74) have contributed an excellent article dealing with the surgical aspects of amebiasis. They estimated that about 1,000,000 people in this country may be considered to have amebiasis of surgical significance.

Lymphogranuloma Venereum

An improved antigen (yolk sac) to be used either for the Frei test or in a simple complement fixation test was developed by Shaffer, Rake, and Grace (89). Lymphogranuloma venereum frequently produces proctitis and sigmoiditis with or without stricture formation. Sulfanilamide and sulfaguanidine have been successfully employed in these cases, especially in the absence of stricture, but prolonged administration of the drug may be necessary (78). Sodium sulfanilyl sulfanilate has given striking relief from symptoms and regeneration of the rectal mucosa in a group of 118 patients with rectal stricture caused by the virus of lymphogranuloma venereum (53). Since the institution of this drug, dilatation was necessary in only 4 patients, 5 per cent in contrast to the previous 75 per cent. None of the patients required colostomy. For persistent discharge probably due to secondary bacterial infection, sulfathiazole either alone or in combination with sodium sulfanilyl sulfanite was employed; this resulted in the disappearance of the discharge. The reviewer is studying the efficacy of succinylsulfathiazole therapy for colonic manifestations of lymphogranuloma venereum. Bacon and Griffin (3) advocate surgical intervention for intractable strictures, for long tubular strictures, or those of the annular type not within reach of the finger or situated above the peritoneal reflection where obstruction is impending. Perineal excision with a permanent abdominal colostomy is the operation of choice. Bacon has performed this operation on 27 patients who are living and well even though the perineal procedure in some instances was difficult and the convalescence protracted.

Syphilis

Syphilis of the intestinal tract was the subject of an interesting study by Levy and Winkelstein (54). In general, the gastrointestinal tract enjoys a relative immunity from syphilis. Anal chancres are superficial but have indurated bases teeming with spirochetes; they resemble nonspecific anal ulcers. Chancre of the rectum occurs infrequently and presents a shallow, punched-out ulcer with an indurated base from which spirochetes may be uncovered. In secondary syphilis, mucous patches may occur on the perineum and in the anal canal; mucous patches are seldom, if ever, observed in the rectum. Condyloma latum is distinguished from condyloma accuminatum by the latter's pedicle and the cauliflower lobulations. Gummas with ulceration and resulting stenosis may occur in the rectum. The syphilitic stricture should be distinguished from that produced by lymphogranuloma venereum and cancer with aid of the intracutaneous Frei test and biopsy, respectively. Acute enteritis may occur during the exanthematous stage of acquired syphilis. In tertiary syphilis mucosal and submucosal elevations are present which have a tendency to ulcerate and subsequently obstruct the bowel. The ulcers have grayish-white infiltrated margins and hard bases; they may perforate and cause localized suppura-

tion or generalized peritonitis. The mesenteric lymph nodes may be involved by numerous miliary gummas. An absolute diagnosis of intestinal syphilis can be made only by finding the spirochetes in the tissues.

Accepted antisyphilitic treatment should be instituted immediately after the diagnosis is established. In the early cases of anal syphilis the continuous system of therapy is recommended although one may use massive dose arsenotherapy by the intravenous drip method, the so-called five-day cure. In late syphilis, routine continuous therapy is preferable. The complications, such as obstruction or perforation, demand immediate surgical interference.

Schistosoma Mansoni Infestation

Warner (110) reported an interesting case with anorectal manifestations of schistosomiasis mansoni (intestinal bilharzia) and gave a complete review of the available literature.

Prolapse of the Rectum

It is now generally agreed, largely as a result of the painstaking studies of Alexis Moschcowitz, that massive rectal prolapse is a sliding hernia and that the prolapse occurs at the expense of the anterior rather than the posterior rectal wall. The adequate treatment according to Graham (35) should aim at the restoration of the normal relationship of the pelvic fascia to the rectal wall and the obliteration of the peritoneal sac. To achieve these objectives the treatment requires an abdominal approach, the opening of the cul-de-sac of Douglas, and the approximation of the levator-ani muscles by suture in front of the rectum. The detailed technique of a new operation proposed by Graham is described.

In a preliminary report, Cohn (18) described and illustrated a new operation for prolapse performed from below. This operation combines established features of many operative procedures which have been done singly before. In this operation, as in Graham's procedure, the pouch is eliminated and the fascial weakness is repaired.

David (22) believes that it is not only the atrophy and weakness of the levator muscles and the depth of the cul-de-sac which favor massive prolapse of the rectum, but a weakness and stretching of the fascia which allows the rectum to prolapse completely and carry the cul-de-sac with it. In the repair of this type of prolapse, the structures in greatest need of support are in the prolapsed portion of the bowel and on its outer surface, namely, the fascia propria and the levator muscles. David maintains that the "atonic anal-sphincter muscles, which have been greatly dilated by the prolapse of the bowel and levator muscles through them," favor early recurrence of the prolapse. The procedure known as the Delorme-Rehn operation takes cognizance of these anatomical facts and is an effective procedure. This operation may be performed under local infiltration anesthesia and consists in the "removal of the mucosa of the prolapsed segment from the mucocutaneous line to the apex of the prolapse. The muscularis of the bowel, levator muscles, and fascia propria in the outer layer of the prolapse are collapsed like a closed accordion by longitudinal puckering-stitches, which reduces the prolapse and makes tighter the supporting levator muscles and fascia propria and places the puckered mass of muscle and fascia above the sphincter muscles, which are narrowed below it by angulating stitches. The excess of freed mucosa is then cut off and the cut surface sutured to the skin. This operation accomplishes everything but obliteration of the cul-de-sac. In women, where the perineal body is gone and the levator muscles are widely separated, it is advisable to perform a later perineorrhaphy."

This operation was carried out successfully by David in 12 cases. The reviewer has found a modification of this operation very effective in 2 recent cases of massive rectal prolapse in women seventy-eight and eighty-five years of age, respectively.

Hemorrhoids

Moore (68) described a new technique of hemorrhoidectomy which consists essentially in freeing the hemorrhoidal mass from a point in the perianal region and reaching the apex (upper angle), above the dentate line without inclusion of any of the fibers of the subcutaneous component of the external anal-sphincter muscle. Then "with a plain catgut suture on a small, full curved cutting needle, all bleeding points are brought up and included in a continuous locked suture along the cut edge of the upper portion of the wound but leaving the lower skin portion of the wound gaping for drainage." Moore, furthermore, states that there are no "buried sutures in any part of the wound to invite abscess and the stumps of the hemorrhoidal veins have been caught up and sutured under the cut edge of the mucosa. Care is taken to leave strips of mucous membrane between each operative field to prevent stricture." At the completion of the operation, there is injected "an anesthetic in oil in fan shape about the anal canal deep in the perianal fat. This part of the operation is so very im-

portant, to prevent pain, sphincter spasm and discomfort." It is well appreciated that surgeons who develop special techniques doubtless obtain good results. However, for the average surgeon, the hemorrhoidectomy of choice is a nontraumatizing procedure that will eliminate the hemorrhoidal varices as well as the sources and channels of infection (anal crypts and anal duct-bearing tissues), and provide ample drainage through open wounds in order to promote the restitution of the inflamed anal and perianal tissues. Sphincter spasm is always absent after the performance of such a procedure; pain, when present, may be easily controlled by analgesics or sedatives. There are many competent proctologists who believe that when cleancut and gentle surgery and meticulous preoperative and postoperative care are employed, there is no need for the long-acting anesthetics (either oil-soluble or aqueous solutions); at best these agents are poor substitutes for good surgery (Merar). The oil-soluble anesthetic agents may produce an aseptic inflammatory reaction of the tissues in which they are injected which eventuates in suppuration and necrosis. The long-acting water-soluble anesthetics frequently produce edema, hyperemia, and bleeding. Ferguson believes "that disadvantages seem to outweigh their advantages."

The office treatment of hemorrhoids consists usually in excision of perianal hematomas and the submucosal injection of sclerosing solutions for uncomplicated internal piles (116).

Injectional therapy is painless, economical, and effective for variable periods of time; this procedure is a treatment and not a cure. Bowers and Schwyzer (9) advocate that in suitable cases, injectional therapy be given a trial in military practice with a view of conserving duty days.

Pruritus

Seletz (88) believes that pruritus ani is a disease entity and that it is almost always mycotic in origin. However, insufficient evidence is introduced to support either contention. Whether or not anal pruritus is a disease entity is a highly controversial matter. The etiological significance of true fungous infection is also a controversial point. The clinical picture produced by bacteria or fungi is distinctly different from that in ordinary anal pruritus. Cultural studies for fungi other than monilia have yielded unsatisfactory results. It should also be remembered that the mere presence of fungi in anal pruritus may be a coincidental finding, as certain fungi, (notably mycoderma geotrichum) may be present in the feces of 40 per cent of normal persons. The part played by perianal and anal dermatophytide and other "ides" has recently received intensive study (Foster, P.D., and Hill, M.R.: *Arch. Derm. Syph.*, Chic., 1940, 41: 699). Brust (14) classifies patients with pruritus ani according to their therapeutic response. Most patients respond to reassurance, anal hygiene, and periodic re-examinations; if after six or eight weeks there is no improvement they are transferred to the second class. These patients may be helped by irradiation, perianal injections of oil-soluble anesthetics, or tattooing with mercury sulfide. The desperate, intractable case may be successfully treated by an extensive subcutaneous injection of ethyl alcohol; this form of therapy is rather drastic, requiring hospitalization and results in a considerable period of disability.

Tattooing of the anal and perianal regions with mercury sulfide as a treatment for intractable anogenital pruritus has been discussed in several publications (95, 100, 101, 103, 107). Good results may be anticipated in the refractory cases of anal pruritus in the presence of cutaneous changes consistent with pruritus. Patients with dry, scaly perianal skin or those who have had excessive irradiation have not responded so well. The results are unpredictable, usually poor, in the patient who complains of severe anal pruritus but whose perianal skin appears normal except for scratch marks. Variable degrees of success were observed by Wheeler (113) in 17 tattooed cases: 13 had satisfactory results, and 4 had a return of itching in a lesser degree than before treatment. Thus far, 9 women with anogenital pruritus (pruritus ani et vulvae) have been relieved of both the anal and vulval itching by tattooing of the perianal and anal regions alone (100). This procedure was reversed in 1 patient: the vulva was tattooed, and the perianal region was left untreated for twenty months. This maneuver had no effect on the anal itching; however, the anal pruritus disappeared only after tattooing of the anoperineal region. Recurrences are usually due to (1) pos[illegible]attoo superficial fissures; (2) infection of the anal ducts and crypts, and (3) inadequate or incomplete tattooing, including skipped areas. The present studies indicate that tattooing with mercury sulfide produces a functional impairment of the cutaneous sensory terminals by reducing their capacity to respond to adequate stimuli. The change in the cutaneous modalities is proportional to the amount of the intracutaneous deposit of mercury sulfide (100). The technique of tattooing has been described in detail and the importance of tattooing of the anal canal to the level of the mucocutaneous junction

as well as of the perianal skin has been stressed (107).

The beneficial effects of androgens and estrogens in senile pruritus have been reported by Feldman, Pollock, and Abarbanel (29). Last year the beneficial effects of androgens on anogenital pruritus in men of the so-called climacteric age were reported for the first time (*J. Clin. Endocr.*, 1941, 1: 851).

Pilonidal Sinus and Cyst

This lesion occurs only in Caucasian races. Unanimous opinion concerning the essential aspects of this lesion is apparently still lacking. Kooistra (49) believes that the pilonidal cyst or sinus is a misnomer because only about 50 per cent of the lesions contain hair. Nesselrod (72) believes that the term pilonidal sinus denotes only the sinus openings and tracts, but he admits that by common usage the terms pilonidal cyst or sinus have become synonymous. Most investigators agree that this lesion arises from the ectoderm; they disagree, however, as to whether the nerve tissue or integument is involved. Kooistra observed that in women symptoms occurred earlier than in men; 40 per cent of the female patients were less than twenty years of age, as compared to 19 per cent of the men. He argues that since the human female reaches puberty earlier than the human male, the pilonidal lesion is apparently activated by the sex hormones. The apparent etiological significance of this fact deserves further study. A relationship of trauma to the precipitation of symptoms apparently exists. In Kooistra's series a definite history of trauma was elicited in 32 per cent of the patients. In 14 per cent of the cases the onset of symptoms occurred within one month of the trauma. The greater preponderance of this lesion in men may be partly ascribed to the fact that men are more often subjected to trauma. Tendler (97) stressed the familial tendency of this lesion, which he observed in 3 families. The reviewer has treated a father and 3 of his 4 sons for pilonidal sinus.

Tendler reported a case of adenocarcinoma with colloid degeneration of the "sweat-gland type" in a pilonidal sinus of long standing.

The tendency toward recurrence characterizes this lesion regardless of the form of surgical procedure utilized. The preoperative use of methylene blue to delineate the extent of the lesion is favored by some (49, 97) and considered unnecessary by others (72).

Injectional sclerosing therapy with Carnoy's solution is applicable to the occasional patient. Incision and drainage are reserved for acute suppurations. Excision and primary closure are advocated for the small, superficial, and uninfected type of pilonidal sinus (49, 97). About 33 per cent of Kooistra's cases of primary closure broke down. The occasional occurrence of a fulminating anaerobic infection following primary closure should be kept in mind. Most conservative surgeons advise block dissection with open packing and meticulous postoperative care. A prolonged healing time usually follows this type of operation. Tendler employed crystalline sulfanilamide packs in 3 cases; this practice was discontinued because of the occurrence of granulation tissue which healed more slowly than usual. The reviewer institutes chemotherapy with 5 per cent sulfathiazole or sulfadiazine in a suitable ointment base immediately after the removal of the packings and he has observed clean and enhanced healing of the wound.

To reduce the time of healing and to restore soldiers to duty as early as possible, De Prizio (24) proposed a new and improved operative procedure:

An oval incision 2 or 3 in. long is made about the sinus openings, and about ½ in. of skin in the median raphe is removed. The dissection is carried under each skin flap for at least 1½ or 2 in. in width for the length of the incision. The cystic mass and gluteal fat is removed en bloc down to the muscle fascia and covering of the sacrococcygeal spine. When the removal of infected tissues and fat is completed, the skin edges adjacent to the midline should not be more than a half inch in thickness, but they should be freely movable and expose part of the gluteal musculature. Any bleeding is controlled by ligatures or the cautery. The skin edges are now drawn down over the exposed gluteal muscles. Interrupted silk or linen sutures are taken on each side at equidistant points, to anchor the edge of the skin to the paramedian portion of the sacrococcygeal periosteum and fascia. This leaves an area from about ¼ to ⅛ in. in width and the length of the wound to heal by granulation tissue. The wound is dressed either with iodoform gauze or dry gauze impregnated with sulfathiazole powder and fastened with adhesive strips. Complete closure is obtained in less than five weeks.

The reviewer (98) has advocated radiation therapy as a substitute for operation for the recurrence of infected pilonidal sinuses, the elimination of which often taxes the surgeon's ingenuity; incidentally, this form of therapy may be considered a useful military expedient. Radiation therapy was suggested mainly on the basis that recurrence after operation is due primarily to the

incomplete extirpation of infected tissues, or the postoperative occurrence of infected granulation tissue. Reoperation, however, is indicated in cases in which branches of the cyst or sinus were incompletely removed at the original operation. Should radiation therapy fail, operation may be performed without hazard.

New Instruments

A new rectosigmoidal biopsy forceps was described (104). This instrument has a cutting-jaw mechanism which operates at an angle of about 30 degrees from the axis of the shaft; the latter has a rotating mechanism which permits 360 degrees of rotation by the jaws.

Psychosomatic Factors

As in the practice of medicine and surgery in general, psychosomatic aspects are prevalent in proctological practice, particularly in patients with colitis and anal pruritus. Daniels (20) in an instructive article described the psychiatric aspects of ulcerative colitis. During the last ten years he treated 25 patients: of 14 followed up for from five to eight years, 8 showed a pathological attachment to a relative (in 6 of these the death of this relative had been of tremendous importance); indecision about marriage was a factor in 2 unmarried persons; in another 2 engagement and marriage were the precipitating factors of the first episode of diarrhea; and in still another 2 the onset of symptoms was associated with childbirth. In 4 individuals financial difficulties were of paramount importance. As a group the patients were not well adjusted sexually, although this did not generally stand out as a presenting problem. The relation between the precipitating factor and the onset of colitis can often be demonstrated because of the promptness of the response. Except for the basic factors which associate emotions with disturbances of the colon, the psychophysiological mechanism of ulcerative colitis is not yet understood. The mechanism may eventually be elucidated by the observations in mucous and spastic colitis. Much could be said of the relation of personality to disease of the colon. Daniels' impression is that the difference lies in the more narcissistic organization of the personalities in ulcerative colitis, with the underlying reaction more a psychotic than a psychoneurotic one. In some patients, the symptoms mark a severe depression. The recurrent character of the disorder is significant in this regard. In several cases, the disease seemed definitely a type of organic suicide. Daniels believes that in many instances there is a direct relation between the severity of the physical reaction and the underlying psychopathological condition. Psychoneuroses rarely cause death; psychoses frequently do.

The psychic factors of anal pruritus are extremely difficult to evaluate because one cannot always be sure of what is cause and what is effect. Anal pruritus may cause nervous symptoms or may play an important part in upsetting a delicately adjusted mental equilibrium. On the other hand, anal pruritus may be a local organic manifestation having the same significance as any organ neurosis or hysterical symptoms. In addition to these two clearcut situations, we encounter an occasional patient who utilizes the symptoms of organic regional pruritus in the interest of a psychological need; the perpetuation of the pruritus then serves a most important psychodynamic function (107).

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Glaser, M. A.: System for the Management of Acute Head Injuries, Based upon 1,000 Personal Cases. *Am. J. Surg.*, 1942, 57: 406.

The purposes of this presentation are to point out that certain time-honored methods in the treatment of head injuries must be discarded, and to suggest a simplified system of treatment. By classifying head injuries according to variations of intracranial pressure, a more accurate diagnosis can be made and the surgical and nonsurgical cases can be differentiated. The sole purpose of all diagnostic procedures in the care of acute head injuries is to determine whether or not an operable hemorrhage is present. Surgery is indicated for hemorrhage and not for increased intracranial pressure due to brain damage. Increased intracranial pressure is not associated with all cases of head injury, and the majority of patients who die do so with a low pressure. Indiscriminate dehydration of every patient with a head injury is without scientific basis.

It has long been assumed that the variations of pulse, blood pressure, pulse pressure, respiration, and temperature are diagnostic of increased intracranial pressure. Clinical signs show the status of the patient but do not indicate the level of the intracranial pressure. The only accurate means of determining a rise of cerebrospinal fluid pressure is by manometric readings. A massive intracranial hemorrhage of sufficient size to cause death will always cause an elevation of the intracranial pressure at some stage. A patient may die from brain damage alone and may have fatal brain damage even though a large clot is removed. It has long been believed that limitation of fluid intake reduces intracranial pressure, but the experience of the author and others indicates that it is not of particular value.

In the shock stage his management does not differ essentially from generally accepted methods. In the post-shock stage he cautions against the early elevation of depressed fractures, prolonged surgery of all types, protracted general anesthesia, unnecessary moving of the patient, manipulation of fractures, and excessive dehydration. If the patient is not responding well, as indicated by increasing coma or paralysis, rising temperature, or marked variations in the pulse and blood pressure, a spinal puncture should be performed immediately, the pressure recorded, and the presence of blood determined. Dehydration should not be done at this time because it may cause a reduction in the pressure and the original pressure will be unknown. Having once established the basic pressure, subsequent manometric readings will determine the progress of the patient. Comparative cell counts on the bloody spinal fluid will indicate whether hemorrhage is increasing or decreasing.

Based upon variations in spinal pressure, a classification of acute head injuries follows:

I. Spinal block (unusual)
   1. Posterior fossa hemorrhage

II. Low intracranial pressure (60 mm. of water or under)
   1. Traumatic
   2. Toxic dehydration

III. Normal intracranial pressure (from 60 to 200 mm. of water)

IV. Intermediary intracranial pressure (from 200 to 300 mm. of water)
   1. Reducible intracranial pressure
   2. Increasing intracranial pressure

V. High intracranial pressure (from 300 to 700 mm. of water)
   1. Reducible intracranial pressure
      (a) Brain damage
   2. Persistent or increasing intracranial pressure
      (a) Extradural hemorrhage
      (b) Subdural hemorrhage
      (c) Intracerebral hemorrhage

I. Cases of spinal block are due to foraminal obstruction resulting from partial herniation of the brain stem into the foramen magnum or to pressure from hemorrhage in the posterior fossa upon the aqueduct of Sylvius. Blocks due to obstruction in the needle should be ruled out. If a block is present, cerebellar exploration or the atlanto-occipital operation of Ody may be performed.

II. The author has seen only 2 cases of low pressure due to trauma in this series. The clinical picture consists of well defined frontal headaches associated with nausea, vomiting, and giddiness, and frequently torpor and mental stupor. The treatment is the injection of from 20 to 40 cc. of distilled water, repeated if necessary or followed by the injection of saline solution. Overenthusiastic osmotherapy and fluid limitation will lead to toxic dehydration. In these cases an increase in fluid intake immediately clears up the symptoms.

III. The majority of patients with craniocerebral injuries have normal intracranial pressure. Spinal drainage, osmotherapy, and surgery are not indicated in this group. Frequently there are focal signs due to localized brain contusion. These areas may be located by the electroencephalogram. Acute cerebral hemorrhage may be present in patients with normal intracranial pressure. In these cases the hemorrhage has not been sufficient to displace the brain.

IV. In cases of intermediate pressure which is reducible by lumbar taps or osmotherapy to below the limit of 200, we may assume that hemorrhage is not a factor. These findings should be considered in conjunction with the clinical picture, and if any doubt exists, surgery is indicated. If the pressure is increasing in spite of repeated taps and osmotherapy, the diagnosis of hemorrhage is likely. Such changes taken in conjunction with the clinical status call for exploration. If in doubt surgery is advisable.

V. High intracranial pressure may be due to brain damage and this pressure may reduce itself spontaneously or be reduced by therapy. If the pressure is consistently reduced and the patient improves clinically, hemorrhage may be ruled out. Brain damage alone will not always account for an intracranial pressure which returns to a high level after repeated reduction. This is suggestive of hemorrhage. When the clinical picture is consistent with such a diagnosis, neurological signs may localize the hemorrhage. Even if the neurological signs are multiple, hemorrhage should not be disregarded, since multiple areas of brain damage may also be present. The hemorrhage may be associated with fatal brain damage.

In cases of high intracranial pressure not associated with hemorrhage surgery is of no value. In such cases subtemporal decompression may do more harm than good. Multiple burr openings should be made when the diagnosis of hemorrhage is made and localization is impossible. Since brain damage and hemorrhage are usually combined, osmotherapy should be used in conjunction with surgery.

The treatment of depressed fractures has two objectives: rendering emergency care for the associated brain damage or hemorrhage, and restoring the cranial defect. If simple rounded or compound fractures are present over nonfunctioning areas elevation is not essential. If one is in doubt as to the character of the depression, elevation is indicated. In cases of compound depressed fractures emergency elevation is not essential. If the condition of these patients does not warrant operative intervention, the compound wounds may be converted into simple wounds by primary suture of the scalp.

JOHN L. LINDQUIST, M.D.

Galloway, T. C.: Infections with Anaerobic Streptococci, with Special Reference to Cranial Osteomyelitis. *Arch. Otolar.*, Chic., 1942, 36: 514.

Infections about the head by anaerobic and microaerophilic streptococci are more common than is generally appreciated. Some of the doubtful factors in the pathogenesis and spread of cranial osteomyelitis may be explained by the behavior of these organisms. Using careful culture methods the author was able to demonstrate anaerobic streptococci in 9 cases of infection of the cranial bones and found that zinc peroxide was effective in control of the infection in some cases. Case reports are given.

In this series there were at least 4 definite types of involvement by anaerobes: (1) an uncontaminated anaerobic infection in which, although the primary focus was osteomyelitis, the spread was in the soft tissues, chiefly along the fascial planes; (2) a necrotizing process involving the soft tissues with secondary "bone death" without the usual picture of osteomyelitis and sequestration; (3) a slow development from compact bone with relatively rapid extension and a fulminating process after the frontal area was reached; and (4) a process involving primarily the frontal bone, as described by Mosher, and carried along the veins and blood spaces. The first two types and probably the third are primarily due to anaerobes. The evidence is less certain in the fourth group.

Some symptoms in this series seemed to be almost pathognomonic of anaerobic infection. These were severe pain, excruciating tenderness, foul odor of the secretion, necrotic tissue, and pronounced induration when fluctuation was not present.

The results of treatment by wide exposure and the application of zinc peroxide cream are discussed.

JOHN L. LINDQUIST, M.D.

Fred, G. B.: Acute Fulminating Osteomyelitis of the Frontal Bone. A Review and a Prediction. *Ann. Otol. Rhinol.*, 1942, 51: 638.

This article is a review of 40 cases of acute fulminating osteomyelitis of the frontal bone occurring on the wards of the Massachusetts Eye and Ear Infirmary during the past ten years (from 1931 to 1941). It does not include chronic cases, traumatic cases, cases which on admission presented a draining fistula, or cases of sinusitis which subsequently developed osteomyelitis after sinus surgery.

The author finds that the low mortality of 30 per cent was due to early removal of the frontal bone in most of the cases. There were 2 males to 1 female. Almost one-half of the cases occurred during the swimming season. Edema was present before the roentgenogram was taken on an average of twelve days in 12 cases. Osteomyelitis was found at operation on both sides in 70 per cent of the cases. The dura was torn in 5 cases with recovery. Most of the patients recovered without ethmoid exenteration. Extradural abscess, subdural abscess, and brain abscess were found in 60 per cent of the cases. On admission one-half of the cases revealed no osteomyelitis by means of the x-rays. Almost one-fourth of the cases were never positive for osteomyelitis as shown by the x-rays, because of early removal of the frontal bone. All patients with osteomyelitis of the anterior wall of the frontal sinus recovered.

The coronal incision with primary closure will probably be the method of choice in the future. It is Fred's opinion that most cases of potential osteomyelitis of the frontal bone will be prevented in the future if adequate chemotherapy plus incision and drainage through the floor of the frontal sinus are instituted early enough in the disease. Further, it is his belief that the operation for removal of the frontal bone will be used in the future only in those rare cases in which proper prophylactic measures

have not previously been used—which is another way of saying that the operation, as a method of choice, is on the way out.

NOAH D. FABRICANT, M.D.

Coughlin, W. T., and Gish, E. R.: Acute Surgical Parotiditis. *Arch. Surg.*, 1942, 45: 361.

Any acute parotiditis, other than mumps, is a surgical disease from beginning to end. This is true whether the disease occurs *per se*, or as a complication or sequel of some other disease. Its incidence in ordinary hospitals is about 1 in 2,000 cases.

The disease occurs with almost equal frequency among medical and surgical patients, but, of the cases occurring in surgical patients, about 85 per cent follow major surgical operations. It occurs most often in those patients who have dry, poorly cleansed mouths.

The most frequent bacterial cause is the staphylococcus—aureus and albus. Early treatment with large doses of sulfanilamide derivatives, particularly sulfathiazole, is indicated. Simple incision is of use only when a frank abscess exists. Treatment by radiation is reported to be of great value.

The mortality rate is lower among those cases in which there are indications for surgical intervention, if incision and uncovering of the gland are done early and properly. SAMUEL KAHN, M.D.

EYE

Smith, B.: Use of the Padgett Dermatome in Ophthalmic Plastic Surgery. *Arch. Ophth.*, 1942, 28: 484.

The author advocates the use of the Padgett dermatome for plastic surgery of the eyelids and orbit. The dermatome which consists of a drum and a movable knife at a fixed distance is used for excision of a uniform graft of skin of predetermined thickness.

The author describes a case of carcinoma of the eyelid associated with ectropion which required two types of skin grafts (see Fig. 1). For the denuded area on the cheek resulting from excision of the tumor a split-skin graft obtained with the dermatome was held in place by rubber cement and dressing instead of sutures and for correction of the defect resulting from the ectropion, a Le Fort-Wolfe graft was used. JOSHUA ZUCKERMAN, M.D.

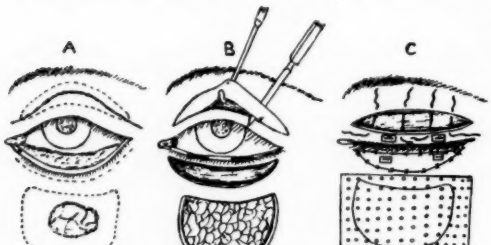

Fig. 1. A, in a case of carcinoma of the cheek an ectropion of the left lower lid was incised on the dotted lines. B, dissection completed and the beds for the Le Fort-Wolfe and for the split-skin grafts prepared. C, the split-skin graft cemented in position, the Le Fort-Wolfe graft sutured, the lid adhesions closed, and the donor wound ready for closure.

EAR

Crowe, S. J., Guild, S. R., Langer, E., Loch, W. E., and Robbins, M. H.: Impaired Hearing in School Children. *Laryngoscope*, 1942, 52: 790.

The authors reported two years ago that 40 per cent of a group of 1,365 children had impairment of hearing for the high tones only. In contrast, only 3 per cent had impairment for all tones or for the spoken voice. Contrary to the classical idea of the effect of catarrhal otitis media on hearing, the authors state that the perception of tones higher than 2,048 frequency, rather than of low tones, is usually impaired first. Of the 40 per cent with high-tone deafness, 152 have been followed up for two years. They were treated by radon irradiation of the lymphoid tissue in the nasopharynx on the basis that restoration of normal ventilation of the middle ear at this early stage will arrest the process and prevent later development of lesions sufficient to impair hearing for conversational tones. The average number of treatments was about four. Of the treated groups 90 per cent had small adenoids or none at all at the end of two years. Twenty-two had had operative removal of the tonsils and adenoids supplemented by radon therapy. The effect of the therapy on the hearing loss for high tones was difficult to evaluate. Two groups were distinguished, one large group with impairment for high tones only, and the second with impairment for conversational tones. As it was recognized that middle-ear lesions could not be distinguished from atrophy of the nerve at the preliminary examination in the first group, a therapeutic test was given in all such cases. Of this group slightly over one-third were found to have a further loss of hearing for high tones in the two-year period while one-third were found to have definite improvement.

The conclusion is made that improvement of the hearing in one-third resulted from improved ventilation of the middle ear, also that the treatment probably arrests progress of impairment in those not improved and prevents later development of impairment to the point where it would be noticeable for conversational tones.

Conclusions of practical significance for the prevention of deafness in children were:

1. Adequate care of acute otitis media is the most important factor.

2. Radon therapy is a further addition to methods for reducing hyperplastic lymphoid masses in the nasopharynx. An applicator containing a suitable amount of radium is now available at a moderate price from one of the large radium companies.

3. It is possible to restore the hearing of many children who have impairment for conversational voice. Methods for picking out these children from any group does not require elaborate equipment. Simple tests are sufficient and those failing the test should be re-examined and receive adequate care.

4. In certain cases, hearing aids may be indicated and it is usually necessary for the otologist to supervise their use in the early stages.

5. The authors do not recommend that an effort be made to pick out all cases of impaired hearing for high tones, unless preparations are made for adequate testing and to follow up with the proper treatment. This type of therapy comes within the scope of preventive medicine and results will not be spectacular. JOHN R. LINDSAY, M.D.

Hill, F. T.: The Changing Conception of the Management of Chronic Progressive Deafness. *Ann. Otol. Rhinol.*, 1942, 51: 653.

Since at present curing deafness appears impossible, all therapeutic efforts finally come down to prevention: correction by circumvention or amplification, or rehabilitation. The changing conception of the management of chronic progressive deafness through these years is a result of better understanding of the physiology of hearing and the pathology of deafness, and the development of precision methods of testing. Many of the older procedures have been retained, while some of those discarded have been revived, as their once theoretical premises have been substantiated by modern research. The effect of tubal obstruction (negative pressure) is recognized and attempts are made to remedy its cause by local treatment, surgical measures in the nose or throat, or by irradiation. The possibility of toxic absorption is kept in mind and measures are undertaken to eradicate foci of infection when indicated. Occupation and environment are of importance, as are good general health and the correction of any nutritional or endocrine deficiency. Above all, there is a need for early recognition and correct diagnosis, if prevention is to be effective.

For the majority of patients with established deafness, sufficient to be handicapping, correction by amplification will be preferable. Operative treatment may be suggested to those who, after critical study, meet all the requirements laid down as essential to successful fenestration, provided they fully understand its present status. Finally, there must be recognition of the importance of cultivating a personal interest in each patient, adapting treatment to individual circumstances and conditions, and endeavoring in all possible ways to assist him to achieve an improved social and economic life.

NOAH D. FABRICANT, M.D.

Carson, L. D.: Otolaryngological Problems Occurring in Fliers. *J. Am. M. Ass.*, 1942, 120: 4.

The problem of aviation medicine is concerned primarily with those conditions which are essentially physiological and subclinical. Some of the subclinical conditions listed as disqualifications for flyers are diseased tonsils, nasal obstructions, diseases of the middle ear, and chronic sinus infection. On the other hand, there are relatively insignificant anatomical abnormalities or functional irregularities which have never aroused the interest of the examiner, but which are definitely disqualifying for aviators because of certain environmental conditions imposed upon them.

Adequate ventilation is of first importance with regard to the nasal structure and accessory sinuses. Polyps are usually regarded as indications of ethmoid disease and are cause for rejection.

Disturbing symptoms occur in the middle ear in descent, or during the return to levels of increased barometric pressure. Partial vacuum within the ear causes engorgement of the capillaries followed by extravasation and hemorrhage. The Valsalva maneuver is generally followed, and there has been no increase in otitis media even when autoinflation was practiced during a cold. Occasionally every possible maneuver fails to accomplish equalization of pressure. Treatment consists in rapid shrinking of the tubal orifice and catheterization if necessary.

The gas introduced by autoinflation should be considered; a high concentration of oxygen may produce more or less complete filling of the ear with exudate and hemorrhage. The solution of the problem is to have the patient hold his breath, exhale, and inflate the ear at the end of expiration, thereby placing alveolar air in the middle ear.

Closely simulating the middle-ear problem is one of like nature involving the ostia of the frontal and maxillary sinuses which become blocked during exposure to strong blasts of air.

There is very little noticeable effect of flying on the pharynx and mouth. The exception is that in the occasional habitual mouth-breather.

The impairment of hearing that is caused by changes of pressure in the middle ear is a purely transient phenomenon. A temporary auditory fatigue is produced by prolonged flights, but this is considered a nonpathological condition.

In learning to fly one must learn to ignore most of those stimuli on which, as a terrestrial being, one has placed chief reliance, and to substitute a completely visual adaptation. This is accomplished by carefully watching the artificial horizon and other instruments and making necessary adjustments.

The author subscribes to the idea that the visual function is most important. Certainly it dominates the other functions. For example, following recovery from a fast right spin the pilot, if flying blind, will receive from his overstimulated labyrinth the very real illusion that he is now spinning to the left. He makes the necessary correction and again reverts to a right spin.

If there is any degree of horizon visible, an exactly opposite phenomenon often occurs following such a spin. The visual illusion is that the horizon is still sweeping to the left and that the plane is turning to

the right. The corrective procedure is to follow the horizon, and a left spin often results—all this in spite of the fact that the vestibular illusion is that of turning to the left. The eye says, "No, we're still turning right," and the conscious mind accepts the visual information and suppresses the labyrinthine. JOHN F. DELPH, M.D.

Robison, J. M.: Subacute Catarrhal Otitis Media and Mastoiditis with Effusion. A Symptom and a Clinical Entity. *South. M. J.*, 1942, 35: 815.

The author offers a classification of catarrhal otitis media and mastoiditis with effusion which regiments these cases clinically according to the presence or absence of coexisting disease in the nose, pharynx, or sinuses.

Some of the physical and chemical characteristics of the effused fluid in the ear in this disease have been noted as follows:

The effusion in one type is an exudate, it has a high protein content (9.95) with many polymorphonuclear leucocytes. The effusion in the second type is a transudate. There are few polymorphonuclear leucocytes, there is a low protein content (1.95), and when the fluid has been present in the tympanum long enough to cause the beginning of the chronic catarrhal stage with its adhesions, large mononuclear leucocytes and epithelial cells make their appearance.

The tendency of this disease to recur and subside spontaneously, the absence of organisms and purulent changes in the effused fluid, and the response to proper treatment lead one to believe that the true cause of the condition is a mechanical one. The basis for such a mechanical theory is as follows:

An infection in the sinuses or nasopharynx is followed by inflammation and enlargement of the lateral retropharyngeal lymph nodes and adjacent perinodal tissues. This may result, on the one hand, in either a mechanical blockage of the tube by direct pressure or displacement of its axis, or the lymph node will swell and act as an obstacle and arrest the normal lymph circulation. The lymphatic trunks above this obstacle dilate, the valves become incompetent, and a retrograde lymph circulation is established.

In this manner, lymph channels in the tubal mucosa will dilate with resulting lymph edema and produce obstruction of the eustachian tube. This mucosal-lymph edema and resulting circulatory change, if allowed to persist, will eventuate in chronic fibrous stricture of the tubal lumen.

The importance of irradiation in the treatment of this disease has been stressed.

JOHN F. DELPH, M.D.

Gwinn, C. D.: Conservative Treatment of Cysts. *J. Am. Dent. Ass.*, 1942, 29: 1675.

The method used by Russell in the treatment of true bone cysts has been applied in the treatment of radicular cysts and briefly described in this article. This treatment includes the extraction of the involved devitalized tooth or teeth, but offers a means of saving the adjacent vital ones, and is applicable in simple bone as well as radicular cysts.

Five case histories with roentgenograms are included and seem to indicate very good results within relatively short periods of time.

WM. G. SKILLEN, D.D.S.

Fowler, E. P., Jr., and Osmun, P. M.: New Bone Growth Due to Cold Water in the Ears. *Arch. Otolar.*, Chic., 1942, 36: 455.

Following the report by Van Gilse at the Collegium Otolaryngologicum in Venice in 1937 that exostoses in the external auditory canal are often found in cold-water swimmers, an attempt was made to determine the effect of repeated exposure to cold water on the external auditory canals and middle ears of guinea pigs. The experiments carried out on 5 animals are reported.

The method was to irrigate slowly the external auditory canals of the anesthetized animals with water at 67.5°F. One animal which was irrigated on only 1 occasion showed no significant change from the normal. The other 4 animals had one ear irrigated once a week for one hour. The number of treatments given was 2, 2, 6, and 9, respectively. One ear was left as a control. Histological sections were made and the following pathological findings noted:

The external canals of the experimental animals showed a slight fibrosis and hyalinization of the soft tissue with occasionally a small amount of new bone. This alteration was not sufficiently striking to be definitely of experimental origin. In the middle ear, however, there was a definite layer of new bone laid down, particularly in the dependent parts of the bulla of the treated ear. The amount of new bone formation seemed to be more or less proportional to the number of times the cold water had been used and to the total elapsed time. There were no changes in the labyrinth capsule except for the slight growth of new bone on the most exposed portion of the promontory. In no case was there any clinical evidence of otitis media and in no case was there sufficient microscopic evidence to explain the formation of new bone on the basis of the injections.

On the basis of these animal experiments as well as of the author's clinical observations the suggestion of Van Gilse that cold-water swimming bears a relation to exostosis or hyperostosis of the external canal is confirmed. JOHN R. LINDSAY, M.D.

NOSE AND SINUSES

Thacker, E. A.: The Value of Fatty-Acid Derivatives in the Treatment of Chronic Obstructive Rhinitis. *Arch. Otolar.*, Chic., 1942, 36: 336.

Thacker proposes a simplified classification of obstructive rhinitis. Sixty-eight patients with nonspecific, nonallergic forms of chronic obstructive rhinitis which shrank well with astringents were treated with submucosal injections of sodium morrhuate (5 per cent solution); 28 patients were given

sylnasol, and 25 were treated with monoethanolamine oleate (5 per cent solution). Excellent clinical results were produced with these fatty-acid derivatives. As long as from one year to eighteen months has elapsed since the patients completed treatment with sodium morrhuate and sylnasol, and nasal obstruction has not occurred. The associated complaints of sphenopalatine ganglion neuralgia, headache, postnasal dripping, and in a few patients anosmia, hoarseness, and coughing, have been either relieved or decreased. Only from four to eight months have passed since the series receiving monoethanolamine oleate completed treatment. The former symptoms of these patients have not returned.

This method of treatment is beneficial as an adjunct in the treatment of patients with obstinate, refractory chronic sinusitis in whom the engorged turbinates prevent drainage and aeration of the sinuses. In 2 patients localized dermatitis developed when sodium morrhuate was given at an interval after several previous injections. Some patients also complained of the fish-oil odor and taste of this solution when it was accidentally spilled on the nasal mucosa. Consequently, the other two fatty-acid derivatives are somewhat more desirable for use than the sodium morrhuate. The clinical results of any of the three fatty-acid preparations are equally good.

Submucosal injection of the fatty-acid solutions is preferable to most of the other forms of therapy because it is easily carried out and requires no expensive equipment, and because no ulcerations or adhesions and no deleterious effect or damage to the mucous membrane follows the treatment. The appearance of this tissue tends to return to that of normal nasal mucosa. NOAH D. FABRICANT, M.D.

MOUTH

Perkins, H. W., and Silver, E. I.: The Rehabilitation of Children with Cleft Palate, Harelip, or Both. *Am. J. Orthodont.*, 1942, 28: 567.

The dental and orthodontic problems encountered in treating over 100 cases of harelip and cleft palate at the Children's Hospital in Boston have been many and varied. The policy of early treatment was adopted at this clinic more than ten years ago and the authors are convinced that treatment should be started promptly after the child is four years of age.

Normal arch form and dental relations are restored early. Openings in the palate are closed with a dermoid or acrylic pad, or a partial denture which prevents the entrance of fluids and other debris into the nasal passage and tends to prevent the child from acquiring faulty tongue habits in speech. Supernumerary teeth sometimes can be moved; more often it is necessary to extract them. In a bilateral cleft, it is sometimes necessary to remove all the teeth erupted in the premaxilla, and in extreme cases partial or complete removal of the premaxilla is required. Then a restoration for this area is essential.

The greatest reward for our efforts in the treatment of these children is derived from the insertion of a restoration as early in their lives as it can be accomplished. We depend on clasps, which usually engage a lug on a convenient tooth, to retain the restoration. Rebuilding of the restorations is not frequent enough to be a handicap, and fear of restricting the growth of the arch can be disregarded.

Recordings of the children's speech are made and repeated at intervals, so that they can note their mistakes and progress toward better speech. A definite problem of sound or muscle control is assigned the child and parent on each visit.

BRADFORD CANNON, M.D.

Lefkowitz, W.: The Effect of Operative Procedures on Noncarious Teeth of Young Persons. *J. Am. Dent. Ass.*, 1942, 29: 1864.

Here are discussed the dangers to the pulp of the tooth in the many operative procedures necessary for its preservation. Particular emphasis is placed upon the treatment of teeth in younger individuals. The article suggests the need for a renewed study of technical measures which may prevent the total loss of the pulp as well as of the tooth itself. Much of the argument forming the basis of the opinions presented is at present theoretical.

WILLIAM G. SKILLEN, D.D.S.

PHARYNX

Francis, T., Jr., Krill, C. E., Toomey, J. A., and Mack, W. N.: Poliomyelitis Following Tonsillectomy. *J. Am. M. Ass.*, 1942, 119: 1392.

Tonsillectomy was performed the same day on 5 apparently healthy children in the same family. All five developed bulbar poliomyelitis from twelve to fourteen days later and three of them died. A sixth and youngest child was not operated on and remained well although poliomyelitis virus was later recovered from his stool.

The authors undertook a careful epidemiological study. The history of all contacts for the previous six weeks was carefully traced. Stools were collected from 54 persons as early as the date of death of the last child until a week later. Emphasis was placed on the children's associates. The stools were studied for the presence of poliomyelitis virus.

Virus was recovered from the stools of 2 cousins living in a city 50 miles away with whom 2 of the children had lived a month earlier. During this visit 1 of the cousins had difficulty, suggestive of poliomyelitis, following tonsillectomy. Four other cousins in another family group with whom the children had lived at a later date were found to be carrying the virus without signs of poliomyelitis. No virus was recovered from 9 adult relatives or from cousins of two other family groups with whom contact had been casual. Of 28 playmates of the afflicted children, a group of 3 children in one family was found carrying the virus. No virus was recovered from inanimate objects.

The failure of the youngest child to become ill although the virus was recovered from his stool con-

vinces the authors that the tonsillectomy performed on an infected subject was the provocative factor. It is assumed that the trauma of operation renders injured nerves more susceptible to infection, and bulbar paralysis is related to direct extension of the virus along the cranial nerves. However, the incubation period differs little in such cases from that encountered in the usual spinal types. The failure to demonstrate the virus in more than one family group among playmates suggests that closer intimacy than ordinary contact is necessary to transmit the virus. MARIAN BARNES, M.D.

NECK

Harding, R. L.: Infections of the Face and Neck. *Am. J. Orthodont.*, 1942, 28: 525.

Most of the acute suppurative infections of the face and neck develop from a focus in the mouth and throat. Treatment is based upon exact anatomical knowledge. The fascial planes of the face and neck are divided into 2 types: the muscular plane and the visceral vascular plane. In the face there are 3 muscular fascial spaces: the space of the body of the mandible, the masticator space, and the parotid space; and there is 1 visceral vascular space, i.e., the lateral pharyngeal space. In the neck the first muscular plane is the superficial layer of cervical fascia enclosing the trapezius and sternocleidomastoid muscles. Beneath this is the second or middle cervical muscular fascia which encloses the sternohyoid and omohyoid muscles. The superficial and middle layers fuse above the hyoid bone, ascend to the lower border of the mandible, and divide about the body of the mandible. The 2 significant spaces in the neck are the submaxillary and sublingual. Infection in the front of the face is important because there are no fascial planes in this region to limit or direct the spread of infection.

The symptoms of infections of the face and neck are those commonly associated with inflammation. There is increasing toxemia until localization occurs. Fluctuation may or may not be elicited. There may be trismus and bulging of the lateral wall of the pharynx with painful and difficult swallowing.

Although infections of the face and neck are not associated with a high mortality, they should command respect and the best in treatment. The most common cause of infection in the space of the body of the mandible is dental disease, with a periapical or an alveolar abscess as the common focus. Treatment consists in the administration of sedation, one of the sulfonamide drugs, and frequent hot saline mouth washes or irrigations. With adequate drainage of the abscessed tooth and judicious conservatism a good result is usually obtained. The incision for drainage of the several spaces of the face and neck should follow the normal lines of the skin as nearly as possible and the incision should be of adequate length.

The sulfonamide group of drugs is of the greatest value, but the sulfonamides are not to be considered a substitute for sound surgical procedures. If pus is present, it still must be evacuated through an incision permitting adequate drainage. The sulfonamides are often an adjunct to surgical treatment. In some cases these drugs will abort the infection and make surgical intervention unnecessary. Another valuable adjunct to early treatment is x-ray therapy.

In the case of alveolar abscesses, local anesthesia is used; for the more extensive suppurative infections, a general anesthetic is the one of choice if the airway is open. BRADFORD CANNON, M.D.

Brighton, G. R., and Altmann, F.: Bowen's Disease and Superficial Mucosal Epithelioma of the Upper Respiratory and Alimentary Tracts. *Arch. Otolar.*, Chic., 1942, 36: 354.

Two typical cases of Bowen's disease of the mucous membrane, one involving the anterior part of the nasal septum and the other the vocal cord, and 4 cases of squamous epithelioma with intraepithelial spread are reported. In the latter case some, but not all, of the characteristics of Bowen's disease were presented. They were called instances of superficial squamous-cell epithelioma of the bowenoid type. In 2 cases the lesion involved the larynx, in 1 case the tonsils and the pharyngeal mucosa, and in 1 the oral mucosa.

The relations between Bowen's disease and bowenoid epithelioma of the mucous membrane are discussed, and it is pointed out that histologically the two lesions are closely related and belong to the same group of changes. The changes described in this article are apparently more common than has heretofore been believed.

NOAH D. FABRICANT, M.D.

Searls, H. H.: Thyroid Disease: Experiences and Conclusions of a Thyroid Committee. *California West. M.*, 1942, 57: 184.

During the past thirty years 4,722 operations for goiter have been performed in the University of California Hospital. The mortality rate has dropped from 6.8 per cent in 1918 to 0.4 per cent in 1940. A mortality rate of 0.5 per cent was maintained in 1924 and 1933. There was an over-all mortality rate of 1.4 per cent. For the past five years there have been follow-up studies on all patients, and during this period 11.6 per cent of the patients developed a postoperative hypothyroidism and an additional 7.5 per cent had myxedema. The oral administration of thyroid substance relieved the symptoms of hypothyroidism and myxedema.

For the past eleven years a committee of internists, roentgenologists, pathologists, and surgeons has met each week to study new patients with thyroid disease and review the old cases. There is fairly universal agreement now among the members of this committee that adenoma with hyperthyroidism and exophthalmic goiter are but different manifestations of the same disease. They, however, recognize basic differences in the treatment of the two conditions.

Acute thyroiditis has rarely been encountered and is treated conservatively. Chronic thyroiditis has occurred more frequently, there having been 5 cases of Riedel struma and 10 cases of Hashimoto struma. Compression of the trachea caused the patients to seek relief. The procedure in each type of lesion was subtotal thyroidectomy. Marked hypofunction, approaching myxedema, followed whether or not any surgical treatment was instituted. The differential diagnosis between Riedel's struma and Hashimoto's disease depended upon the microscopic findings.

One hundred and twenty-one cases of malignancy were observed. The committee was impressed by a very high per cent of cases of cancer developing in pre-existing benign adenomas. The ratio of thyroid malignancy to nodular goiter was 1:34 in women and 1:17 in men. Nodular goiter is considered a precancerous lesion and excision is advised. The prognosis in malignant goiter varies with the microscopic pattern. Papillary adenocarcinoma may be held dormant for years, or may even be cured, the author believes, by radical surgery and the judicial use of x-ray treatment. On the other hand, malignant adenoma of fetal pattern and the so-called malignant adenoma of Langhans have a very poor prognosis.

Treatment of simple or adolescent goiter should be by the oral administration of thyroid. Nodular goiter is considered surgical whether nontoxic or toxic, and its treatment by x-ray is considered irrational. Toxic diffuse (exophthalmic) goiter has been treated by subtotal resection in a majority of cases. A selected series was successfully relieved, in the opinion of the author, by roentgen therapy. Early recurrences of hyperthyroidism responded well to small doses of roentgen rays. The committee recommends a more radical surgical removal of the thyroid gland in young patients than in adults.

Iodine should be used as a prophylactic public health measure. It should be used in the treatment of exophthalmic goiter as a preoperative measure and not for prolonged periods of time. Iodine is contraindicated if the gland is to be subjected to radiation therapy. In toxic diffuse goiter 5 drops of iodine is given once daily for one month postoperatively.

EARL O. LATIMER, M.D.

Albright, H. L., and Clute, H. M.: Six Years' Experience of the Thyroid Service at the Massachusetts Memorial Hospital. *N. England J. M.*, 1942, 227: 363.

The thyroid service at the Massachusetts Memorial Hospital includes representatives of the associated specialties of otolaryngology and ophthalmology, internists, cardiologists, and surgeons. In the six years since this service was established, 334 thyroid operations have been performed on 288 patients, with 6 deaths, the operative mortality being 1.8 per cent and the patient mortality 2.1 per cent. The ratio of females to males was 5.3 to 1. The youngest patient was fifteen years old and had an exophthalmic goiter; the oldest was seventy-one years of age and had a carcinoma of the thyroid gland.

There were 139 patients suffering from exophthalmic goiter, and the ratio of females to males was 3.3 to 1. There were 176 operations in this group with 3 deaths, an operative mortality of 1.7 per cent. There were 18 thyrocardiac cases in this group, all of them being subjected to a two-stage operation. These 18 patients accounted for 2 of the 3 deaths among the patients with exophthalmic goiter. Thirty-seven per cent of the patients with exophthalmic goiter were subjected to a two-stage procedure. There were 12 postoperative thyroid crises among this group. The major factor in the 3 deaths was a thyroid crisis. More recently, thyroid crises have decreased probably because of longer preparation for surgery, the increased use of oxygen postoperatively, adequately large doses of morphine, and the preoperative use of fluids and glucose. There was 1 transient and 2 permanent cases of unilateral recurrent paralysis of the laryngeal nerve. One patient had a persistent hypoparathyroid tetany. There was an over-all recurrence of hyperthyroidism in 11.5 per cent of this group, but in only 8.0 per cent did its severity warrant reoperation. Hypothyroidism occurred in 5.7 per cent of the cases, and this may be even higher when the more recent operative cases are checked. There was 1 case of progressive malignant exophthalmos although the hyperthyroidism was overcome; this case improved only after removal of a portion of the bony roof of each orbit.

Forty patients with adenomatous goiters with hyperthyroidism had 47 operations. The ratio of females to males was 9 to 1. Eighteen per cent had a two-stage operation. There were 9 thyrocardiac patients; 1 death occurred in this group, while another patient died of postoperative thyroid crisis. There was 1 transient and 1 permanent case of unilateral paralysis of the vocal cords. No cases are known to have developed recurrent hyperthyroidism. There was 1 case of postoperative hemorrhage which was reoperated upon with recovery. No cases of hyperthyroidism developed.

Seventy-four patients who had thyroid adenomas without hyperthyroidism were subjected to single-stage operations without a fatality. The majority of these adenomas were subclavicular or substernal.

Seven patients had thyroid carcinomas and in 5 radical thyroidectomy was carried out, but in no case were the cervical lymph nodes or the internal jugular vein removed. In 2 only a biopsy was done with 1 death on the eighth postoperative day. The remaining 6 received postoperative x-ray therapy and are symptom-free from four to twenty-six months after operation. There were 2 patients each with parathyroid adenomas, lateral aberrant thyroid tissue, and persistent remnants of the thyroglossal duct.

EARL O. LATIMER, M.D.

Cope, O.: Hyperparathyroidism. Sixty-Seven Cases in Ten Years. *J. Missouri M. Ass.*, 1942, 39: 273.

Sixty-seven cases of hyperparathyroidism have been proved by operation at the Massachusetts General Hospital in the past ten years.

Hyperparathyroidism is primarily a disease of disordered metabolism, not a bone disease. The author states that the patient with the most common type of this glandular disease has normal bones.

The classic type of bone disease with tumors and cysts comprised 28 per cent of the total number of cases, the bone disease having been the clue to the diagnosis. Another 17 per cent showed bone involvement in the form of diffuse skeletal decalcification, but the majority of these cases were diagnosed because of the concomitant renal-stone complication. Fifty-five per cent of the cases had no bone disease demonstrable either by means of roentgen rays or bone biopsy; attention was called to the disease by the kidney stone.

The classic form, von Recklinghausen's disease, offers no difficulty in diagnosis. No metabolic observations are necessary. The bone cysts and tumors distributed in rarified bones are clearly visible by means of roentgen rays and are diagnostic. Since the disease is hormonal the bone picture is generalized.

Any patient presenting calcifications in the urinary tract or a history of having passed a stone should be suspected of the disease. Between 10 and 15 per cent of the patients with renal stone seen by Albright and the author proved to have hyperparathyroidism.

Persistence is required to make the diagnosis in the patient with mild symptoms. Suggestive information may be obtained by determining the urinary output of calcium while the patient is on a low calcium diet for at least three days previous to collecting the twenty-four-hour urinary specimen.

The fasting blood levels of calcium and phosphorus must be checked in a laboratory experienced in making these determinations. In order to evaluate the calcium level, the serum protein must be measured; the total blood calcium is composed of protein bound as well as ionized calcium. The latter is elevated only in hyperparathyroidism. A low serum protein points to a high ionized calcium if the total level is normal. A persistent low phosphorus is diagnostic even in the absence of an elevated serum calcium provided the urinary excretion of calcium is increased. Repeated tests may be required to establish or disprove the diagnosis.

Surgery is the treatment of choice. A high-calcium diet and x-ray therapy are unsatisfactory. A knowledge of the regional anatomy of the neck is not sufficient for parathyroid surgery. The surgeon should be able to recognize the various types of parathyroid tissue. The author and his colleagues have found the parathyroid tumors all the way from the larynx to the heart. This widespread distribution is due to the embryological origin of these glands. The upper two glands develop along with the lateral thyroid lobes and therefore in their final position they rest somewhere near the thyroid tissue. The lower two glands develop with the thymus gland from a higher branchial cleft. In their descent in the neck they may drop off anywhere. Usually they stop near the lower thyroid pole, but in 10 per cent of the cases they remain with the thymus and finally are found to rest in the anterior mediastinum.

EARL O. LATIMER, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Ray, B. S.: Platybasia with Involvement of the Central Nervous System. *Ann. Surg.*, 1942, 116: 231.

Platybasia is a deformity of the occipital bone and the upper cervical vertebrae, in which the foramen magnum and upper cervical vertebrae are displaced upward. Four cases of platybasia are reported, with a discussion of etiological factors, structural changes, and nervous manifestations of the deformity. All patients had abnormal neurological symptoms and signs and were treated by suboccipital and upper cervical decompression with improvement following operation in each instance. Two of the craniovertebral deformities were apparently congenital while the other 2 were definitely acquired. In 1 of the congenital cases there was a history of rickets which was probably of no etiological significance. The 2 acquired deformities were associated with osteogenesis imperfecta and Paget's disease, respectively. In both of these patients previous x-ray studies had been made which proved progression of the basilar deformity.

In platybasia the relative location, size, and shape of the foramen magnum as well as that of the upper cervical canal are altered, and the posterior fossa is diminished in capacity. This may cause no untoward symptoms, but, on the other hand, it may be associated with congenital anomalies of the nervous system or be the direct cause of progressive nervous changes. The resulting clinical manifestations may be confused with those of posterior fossa or upper cervical tumors, hydrocephalus, syringomyelia, syringobulbia, multiple sclerosis, and spinocerebellar disease. It is difficult to explain the onset of nervous symptoms in congenital platybasia relatively late in life, if they are solely the direct result of pressure on nervous structures.

The final diagnosis of platybasia depends upon the demonstration of the deformity by roentgenograms. The changes to be seen in lateral views include rudimentary development of the occipitoatlantoaxial region; dislocation of the atlas and axis upward and forward; projection of the odontoid process above a line drawn from the posterior rim of the foramen magnum to the hard palate; upward displacement of the clivus; and invagination of the posterior rim of the foramen magnum. Sagittal views show: asymmetry of the posterior cranial fossa and foramen magnum; upward dislocation of the atlas and axis; abnormal relationships of the various structures about the atlanto-occipital region; unusual shape and asymmetry of the petrous portions of the temporal bones; and broad biparietal measurement of the skull. The physical appearance of the patient may suggest the deformity. The neck is short and thick and the head is carried forward of the perpendicular axis of the body.

Nervous manifestations may be the result of associated congenital anomalies or defects of the nervous system, or of acquired nervous system changes resulting from (1) direct pressure on the brain stem, cranial nerves, cerebellum, and cervical cord, (2) embarrassment of the blood supply of these structures by adhesions or compression, and (3) interference with the cerebrospinal fluid pathways.

When neurological symptoms are disabling or progressive, operative decompression of the cerebellum and upper cervical cord is of value in improving or arresting the progress of the nervous changes. Simple operative decompression is not unduly hazardous.

JOHN L. LINDQUIST, M.D.

Dyke, C. G.: Acquired Subtentorial Pressure Diverticulum of a Cerebral Lateral Ventricle. *Radiology*, 1942, 39: 167.

This subject is of great interest, not only to neurosurgeons, but also to radiologists who have to interpret films of the head following the injection of air.

The condition described is extremely rare because in the author's great experience he has only encountered 3 cases. These 3 cases are reported in detail with suitable photographs of the skull. The paper is to show that subtentorial collections of air might occur which are, in a manner of speaking, artefacts. The artefact is caused by the herniation of part of the lateral ventricle through the incisura into the posterior fossa. When this herniation is filled with air, it gives the impression of occurring in the posterior fossa and thus could lead to confusion. The characteristic findings in a pneumencephalogram or a pneumoventriculogram are shown in the article and criteria for avoiding confusion are given. Two of the patients had occlusion of the aqueduct and the third had a large parasagittal meningioma with considerable distortion of the ventricles. The paper represents a distinct advance in a highly technical matter.

ADRIEN VERBRUGGHEN, M.D.

Sjaardema, H., and Glaser, M. A.: The Electroencephalographic Diagnosis of Subdural Hemorrhage. *Ann. Surg.*, 1942, 116: 452.

The clinical diagnosis and localization of subdural and extradural hemorrhage are sometimes impossible, and the electroencephalographic wave pattern which is described by the authors will be of great value in the differential diagnosis. The authors found by experimental study in rabbits that cortical pressure without destruction of the underlying brain produces a pattern which consists of high beta waves superimposed upon delta waves. Three cases of verified subdural hematoma in which characteristic pressure wave patterns were present and disappeared after removal of the hematoma are reported. It is

admitted that similar waves are sometimes found in hydrocephalus, meningioma, tuberculoma, Parkinson's disease, syphilis, and in some cases of brain trauma without operable hemorrhage.

The wave pattern consists of: (1) delta waves of 1 or 2 cycle waves per second, and from 10 to 20 microvolts, and up; and (2) beta waves alternating or superimposed upon the deltas of from 16 to 25 cycles per second, and from 10 to 20 microvolts, and up. The clinical signs and the association of the combination waves aid in verifying the hemorrhage and its localization. HAROLD C. OCHSNER, M.D.

PERIPHERAL NERVES

Holmes, W., and Medawar, P. B.: Local Application of Sulfanilamide to Peripheral Nerves. *Lancet*, Lond., 1942, 243: 334.

As nerve paralyses have often been reported after the systemic use of sulfonamides, it seems likely that the toxic effect of these drugs on nerves would be even more definite when they are used locally. In a short series of experiments, the toxic action of sulfanilamide applied in large amounts locally to the sciatic nerve of the rabbit caused functional interruption of the nerve and wallerian degeneration.

Finely powdered sterile sulfanilamide was packed along the sciatic nerve, which was exposed by an incision from the head of the femur to the knee, below the biceps muscle. The nerve itself was not touched and it remained protected by a fascial layer. The animals in the first series received an application of 1 gm., and the animals in the other of the two series received 2 gm. of sulfanilamide. The nerve and surrounding muscle was covered over a length of some 4 cm.

Within twenty-four hours of the operation, the animals were tested for sensory and motor disturbances. Those treated with an application of 2 gm. were insensitive to pin prick over the whole of the foot on the operated side, and they had lost the power to spread the toes, an action mediated by the peroneal nerve. The animals treated with 1 gm. of sulfanilamide showed no functional disturbance. Fifteen days after the operation, specimens of the peroneal and tibial nerves at the site of application, and the posterior nerve from the shank, were removed for histological examination.

There was no significant pathological change in the nerves from the animals that received the smaller applications. Both the axons and the myelin sheaths had degenerated at the site of application in the animals which had received 2 gm. of sulfanilamide. The degeneration differed from that seen after simple section of a nerve in that macrophages and Schwann cells were much less abundant, and the removal of the myelin and axon remains was not proceeding normally. Proximal to the region of application the fibers were normal and the axons were sending out regenerative sprouts into the damaged portion of the nerve. Distally, the posterior tibial nerve contained no intact fibers, and wallerian degeneration with Schwann-cell proliferation and macrophage invasion was proceeding normally. The blood vessels of the nerve trunk at the site of application were considerably damaged; there had been rupture of their walls and extensive hemorrhage into the tissue and lymph spaces of the epineurium and between the nerve fibers themselves.

Since Schwann cells play an important part in the reformation of new myelinated fibers in regeneration, 1 animal of the 2 gm. series was permitted to survive for sixty days after the sulfanilamide application, to determine whether regeneration was seriously delayed by the injury to the Schwann cells. At the end of this time the nerve at the site of application and the posterior tibial nerve were full of large regenerated myelinated fibers. Regeneration had been as rapid as possible, and recovery would probably have been excellent since the injury was a true "lesion in continuity," the axons and myelin being interrupted but the endoneurial tubes remaining intact.

The effect of the sulfanilamide cannot have been due to the nonspecific irritation set up by the undissolved powder in the wound site because the reaction within the nerve trunk could only have been brought about by the sulfanilamide which diffused through the epineurial sheaths in true solution.

The fact that the nerve trunk can withstand as much as 1 gm. of the drug packed into the thigh space shows that the toxic effect is feeble. On the other hand, the fact that it cannot withstand 2 gm. applied under similar conditions shows that the toxicity under unfavorable circumstances may be significant.

Since sulfanilamide is sufficiently soluble to exert a direct damaging effect on nerves, it should be used with caution in operations in which peripheral nerve trunks are to be exposed.

ALFRED B. LONGACRE, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Gill, A. M., Jones, R. A., and Pollak, L.: Tietze's Disease. *Brit. M. J.*, 1942, 2: 155.

Tietze's disease consists of the nonsuppurative and nonspecific swelling of rib cartilage. In 1921 the author described this condition in 4 patients aged from twenty-eight to fifty, 3 females and 1 male. "All showed the same clinical picture, viz., swellings of costal cartilages of insidious onset associated with little or no constitutional disturbance, spontaneously painful, and with a prolonged course characterized by fluctuations in the size and tenderness of the swellings."

One case lasting over a year showed no signs of suppuration. The lesions were firm and were confined to the cartilages, which appeared to be expanded locally. The skin over them was normal and freely movable.

In 1 patient, the intercostal space was filled by the mass. In 2 patients, aged forty-two and fifty, roentgenograms showed calcifications of the cartilage, but this may have been coincidental.

Tietze stressed his ignorance of the nature of this condition and, although he had encountered his cases in a short space of time, he had never seen a similar condition before, nor could he find any reference to such cases in the literature.

Tietze's biopsy findings regarding the morbid anatomy, are as follows:

"The histological examination shows chondral tissue, the irregular arrangement of which suggests neoplasm, but there are no signs of malignancy. I, therefore, removed the entire mass, which consisted of 2 cartilages and part of the sternum. To our surprise, the cartilages were not abnormal; the soft tissues, perichondrium, muscles, fascia, and ligaments were thickened, but microscopically did not show any inflammatory changes. The cartilages showed histological changes, described above, and here and there calcium deposits and dissolution into fibres."

Following the authors' report there were a few cases found by Hartung, Froehlich, Kuettner, Satani, and Fujii.

The extreme rarity of such cases induced Gill, Jones, and Pollak to report on 5 young soldiers showing the syndrome described by Tietze. All of these cases were complicated as follows: No. 1, bronchopneumonia, No. 2, cough of two weeks' duration, No. 3, bronchitis following appendectomy, No. 4, pneumonia, and No. 5, pneumonia following tonsillectomy. Otherwise, the symptomatology and biopsy findings coincided with those of Tietze's. Even cultures were negative.

All of their intense special investigations have failed to throw any light on the etiology of the syndrome.

Tietze, in discussing the etiology, suggested that the condition represented a dystrophic change in the cartilage analogous to the bone disease of nutritional origin, which was prevalent in Germany in the early 1920's. "But in all our young soldiers there has been no evidence of malnutrition, and all were good physical specimens of humanity." No light on the pathology was given and there was no proof of nutritional disturbance in these soldiers. However, the national dietary has been altered, and "Therefore," they state, "qualitative changes in food of which we are ignorant may be of etiological significance."

MATHIAS J. SEIFERT, M.D.

TRACHEA, LUNGS, AND PLEURA

Moore, R. L.: Pulmonary Abscess—A Surgical Problem. *Ann. Surg.*, 1942, 116: 373.

The author believes that the use of a pathological classification for pulmonary abscesses is of greater value than the use of a clinical classification. It is his opinion that the terms "acute" and "chronic" abscesses, based on rather indefinite time limits, could advantageously be replaced by the terms "uncomplicated" and "complicated." An analysis of 78 cases was the basis of this report. A case was considered uncomplicated when there was only 1 abscess unassociated with empyema, notable fibrosis, bronchiectasis, or other serious complications. When there were multiple abscesses, empyema or pyopneumothorax, notable fibrosis, bronchiectasis, or other more rare complications, such as suppurative pericarditis and suppurative mediastinitis, the cases were classified as complicated. From a bacteriological standpoint, abscesses are of two main types: fetid, or anaerobic, and nonfetid, or aerobic.

In spite of the fact that complete studies were not made in the 78 cases, the anaerobic streptococcus, bacterium melaninogenicum, vibrio, spirochaeta, or fusiform bacillus, single or in varying combinations, was recovered from the sputum, the abscess contents, or from empyema fluid in 42 of the 70 cases of fetid abscess in the series. The organisms recovered in the nonfetid abscesses included the Friedlander bacillus in 1 case, aspergillus fumigatus in 1 case, pneumococcus Type III in 1 case, hemolytic staphylococcus aureus in 1 case, and hemolytic streptococcus in 2 cases. The history of onset of the majority of the fetid abscesses suggests that they are due to aspiration of infected material from the mouth. In contrast, the history of onset of most of the nonfetid abscesses suggests an embolic or postpneumonic origin. Pulmonary abscesses begin as localized areas of necrosis and suppuration. Adequate drainage is necessary to prevent the formation of fibrosis and bronchiectasis; inadequate drainage may lead to a spreading pneumonitis, bronchopneumonia, secondary abscesses, and empyema. Although con-

servative treatment deserves a trial in the uncomplicated abscesses, it should not be continued if there is not progressive improvement. An abscess seen early in its uncomplicated state should not be allowed to go without the benefits of surgical intervention until it has become a complicated abscess. In this series, 54 of 78, or 69 per cent of the cases, were not referred for surgery until this stage of complication had been reached. Early free drainage is essential as a means of preventing the development of complications, as well as reducing the operative mortality and the incidence of unsatisfactory late results in complicated cases. The choice of a one-stage or two-stage operation depends upon the condition in the individual case when drainage is indicated, and the success of the operation is dependent largely upon the precise localization of the abscess. In cases in which empyema is present, the empyema should be drained first, of course. Empyema did not occur in any of the 8 cases of nonfetid abscess included in this report, but it was found to be present in 23 per cent of the cases of fetid abscess. Complicated abscesses of both the fetid and nonfetid types are surgical conditions. Treatment depends upon the requirements in each particular case. This may be a simple unroofing of the abscess, cauterization of the lesion (best done with the actual instead of the electric cautery), or, if necessary, excision, with lobectomy or pneumonectomy.

In this series of 78 consecutive cases seen during the past eleven years, 51 were males and 27 were females. Complications had already developed in 54 patients at the time of operation. Thirty-one had had symptoms for a period of less than two months; of these, 18 (58 per cent) were found to have complications. The same percentage of complicated cases was shown in those patients whose symptoms were of three months' duration. In other words, the time interval usually used to divide the acute from the chronic stage of an abscess did not show any change in the pathology. Of the 23 patients with uncomplicated abscesses of the fetid type, 21 recovered and are still alive. The 1 case of uncomplicated nonfetid abscess was cured by operation. Of 14 patients with complicated abscesses of the fetid type and multiple cavities, 9 recovered and 5 have healed wounds and are symptom-free at the present time. Eleven of 16 patients with fetid abscess complicated by empyema recovered, and 10 now have healed wounds and are symptom-free. Of 15 patients with fetid abscesses complicated by fibrosis and bronchiectasis, 10 recovered, but only 4 have healed wounds and are symptom-free. Six of the 7 patients with nonfetid abscesses complicated by notable fibrosis recovered, and 4 of these have healed wounds and are symptom-free. Of the entire series of 78 patients who were operated upon, 43 (55.1 per cent) are apparently cured, 10 (12.8 per cent) have bronchial fistulas, 5 (6.4 per cent) have healed wounds but are still troubled with persistent cough and sputum, and 20 (25.7 per cent) are dead.

H. C. JERNIGAN, M.D.

Neuhof, H., and Touroff, A. S. W.: Acute Putrid Abscess of the Lung. Hyperacute Variety. *J. Thorac. Surg.*, 1942, 12: 98.

Early surgical treatment of acute lung abscess is far from universally accepted at the present time. Conservative management is advocated frequently, as it is thought that many patients will not need operation and that others are too sick to undergo surgical treatment. The present article deals with a particular kind of acute lung abscess designated as "hyperacute," and the authors believe that surgical treatment is needed earlier in this group of cases than in ordinary acute lung abscess. The lesion under discussion is also related to a condition known as gangrene of the lung and the authors speak of an ill-defined zone about the abscess as "gangrene of the lung." A case report illustrates the type of abscess under discussion.

An adult male was admitted with the history of cough and fever for two weeks. One week after onset the sputum became intensely foul and copious and the patient was quite weak. Glycosuria was also discovered. On admission the patient was profoundly toxic with a pulse as high as 124 and with a septic temperature. X-rays revealed a large cavity with a fluid level in the right apex. Medical treatment was instituted for five days, the diagnosis being encapsulated pyopneumothorax. The abscess was then drained through the third rib bed following the resection of a segment of that rib. The cavity measured 10 cm. in diameter, the contents consisting of foul-smelling pus and pulmonary slough. Several bronchial fistulas were present and the lesion was obviously a lung abscess. The postoperative course was quite uneventful, the patient being discharged symptom-free in three weeks.

This operation was performed in 1930, and if the preoperative diagnosis had been lung abscess the operation would have been delayed and the patient undoubtedly would have expired.

"Hyperacute abscess" is defined as one with a severe fulminating clinical course, a short history, and profound toxemia. The authors regard it as a lesion from which recovery under conservative therapy is highly unlikely.

X-ray examination may show a characteristic picture in some cases but usually the findings are insufficient for a definite diagnosis. Usually a large area of excavation with fluid level is present. More infiltration of the wall of the abscess is present than in usual acute abscesses. The pleural reaction may be intense and extensive and the borders of the abscess may be irregular or scalloped because of gangrenous pulmonary sloughs. The latter may suggest coexisting bronchial pneumonia. A case report is given in which such a diagnosis was made and the patient was treated for one week for a pneumonic condition.

If perforation of the abscess into the pleural cavity is suggested by the x-rays this should not prevent operative therapy. If at the time of operation the two pleuras are not fused, another site for

drainage, where adhesions are present, should immediately be chosen. A case report is presented to illustrate this point.

Indications for operation. In view of the urgent need for drainage of this lesion the only contraindication for operation is a moribund patient. A one-stage operation is advised, since haste in opening the abscess adequately to alter the anaerobic condition is imperative. The technique of the operation may be slightly different from that for ordinary acute lung abscess, since the adhesions between the two pleuras may not be as firm. For this reason, rib resection should extend only to the edge of the outlines of the cavity in order that break-down adhesions due to coughing or manipulation may be prevented. All pus and free necrotic matter should be evacuated and the abscess cavity unroofed, after which it is packed slightly with gauze.

The results in 122 cases of acute putrid abscess show only 4 deaths, a mortality of 3.27 per cent. Thirty-eight of the 122 were "hyperacute" with 3 deaths, a mortality of 7.9 per cent. The other 84 were of the ordinary acute type with 1 death, a mortality of 1.19 per cent. Thirty-two additional cases have been operated upon since the submission of this article with no deaths; thus the total over-all mortality is only 2.6 per cent.

WILLIAM E. ADAMS, M.D.

Cournand, A., and Berry, F. B.: The Effect of Pneumonectomy upon Cardiopulmonary Function in Adult Patients. *Ann. Surg.*, 1942, 116: 532.

Pneumonectomy has become the accepted treatment for many cases of malignant and suppurative diseases of the lung. The present study was carried out on 12 patients to determine the physiological effects of the removal of one entire lung. Briefly the study consisted of the following measurements:

Lung volumes and subdivisions; maximum breathing capacity; ventilation, breathing reserve, and respiratory gas exchange under basal conditions, during moderate exercise, and during fifteen-minute periods of recovery following exercise; study of respiratory gases in the arterial blood at rest and immediately after completion of moderate exercise; and variations in venous pressure, circulation time, and vital capacity following an increase in blood volume produced by a rapid intravenous injection of 1,500 cc. of a saline solution.

The results may be grouped under four headings: (1) the state of pulmonary and cardiocirculatory function after pneumonectomy in comparison with normal subjects; (2) the state of ventilatory function before and after pneumonectomy; (3) the influence of thoracoplasty supplementing a pneumonectomy upon the state of ventilatory function, and (4) the influence of mediastinal adjustment and pre-existing pulmonary emphysema upon pulmonary function.

Ventilatory function. Following pneumonectomy in 10 patients the main findings concerning the anatomical status of the lung were as follows: the lung in older groups was somewhat distended; in younger subjects the efficiency of the chest bellows in displacing air was better than predicted, but in the older age group it was about the same as predicted. Also, in the younger subjects there was hyperventilation which tended to produce dyspnea.

Following pneumonectomy there was some lowering of the efficiency in supplying oxygen to the tissues, especially on exertion in the older patients. This group also showed hyperventilation and tolerated exercise less poorly. Aeration of the blood leaving the lung remained within the normal range. Following pneumonectomy in 4 patients thoracoplasty was done. In 2 of these patients it was difficult to evaluate the influence of the thoracoplasty on the physiological processes. However, it appeared to impair the ventilating function very little. In general, thoracoplasty did not impair further the mechanics of the chest bellows, and in some cases it appeared to improve the pulmonary function. Regarding the exact mechanism of the production of so-called "drowned lung" little definite information could be given. Whether this was on the basis of pulmonary failure or cardiac failure could not be determined. It was impossible to predict whether cardiac failure would develop in any given case.

The chief difference between patients who had undergone pneumonectomy and normal subjects was the reduction in the breathing reserve of the former in various states of activity. This was greater in older patients because of the accumulative effect of abnormal hyperventilation. The late effects of pneumonectomy upon gas exchange in the lungs, the state of respiratory gases in the arterial blood, and the cardiac circulatory function were insignificant.

WILLIAM E. ADAMS, M.D.

ESOPHAGUS AND MEDIASTINUM

Griffin, R. J.: A Diagnostic Sign of Spontaneous Interstitial Emphysema of the Mediastinum. Case Reports. *Ann. Int. M.*, 1942, 17: 295.

Three cases of spontaneous pneumothorax occurring in male students attending the University of Kentucky in which a diagnostic sign of mediastinal emphysema was present, are reported. This sign is described as a "popping" or "crunching" sound heard over the precordium; it is audible to the patients. The case reports were as follows:

1. A white male of eighteen years experienced a sharp pain over the region of the heart and some dyspnea. Physical and x-ray examination revealed a left hydropneumothorax. Three days later the patient was conscious of a "crunching" sound in his chest and this was heard on examination of the chest. This persisted for one week with complete recovery thereafter.

2. A twenty-year-old white male working in a printing office, developed a sudden pain in the chest which was accompanied by a faint "popping" or "crackling" sound also audible through a stethescope. A roentgenogram revealed a left hydropneu-

mothorax. The symptoms persisted for about one week after which there was complete recovery. In this case there was a history of two previous attacks.

3. On routine physical examination of an eighteen-year-old white male entering the university the author heard faint crunching sounds over the precordium. On questioning it was found that the student had experienced sharp pain in the left chest while playing a trombone three days before. He was unable to continue playing. A pneumothorax was found on physical and x-ray examination. There was complete recovery.

Two of these patients had had a recent cold. All 3 were tall, thin individuals.

This sign has been described by Hamman, who explains it on the basis of the presence of bubbles of air overlying the pericardium. Also, interstitial emphysema is commonly associated with spontaneous pneumothorax and is probably a step in its production as produced experimentally by Macklin and others. All cases observed having Hamman's sign revealed a pneumothorax on the left side. The sound has been described as similar to that produced by rubbing two inflated balloons together or pinching an inflated balloon and allowing the fingers to slip over the surface. WILLIAM E. ADAMS, M.D.

MISCELLANEOUS

Jesser, J. H., and DeTakats, G.: The Bronchial Factor in Pulmonary Embolism. *Surgery*, 1942, 12: 541.

An experimental study was made to determine the effects of pulmonary embolism on the bronchial tree. Seven series of experiments were performed on dogs by injecting a mixture of barium sulfate, iron perchloride, and normal salt solution into the femoral vein. The bronchial tree was visualized by x-ray examination following the intratracheal injection of from 5 to 6 cc. of iodochloral.

Series 1 (control). In 12 dogs roentgenograms of the chest were made following the introduction of iodochloral. Immediately after the production of pulmonary emboli a second exposure was made which showed that the opaque material had been squeezed into the terminal radicals. The results were the same in all 12 animals. Classical dyspnea and cyanosis of pulmonary embolism were noted.

Series 2. In this group of 3 dogs, following visualization of the bronchi, the trachea was clamped, which resulted in marked dyspnea and cyanosis. X-rays revealed no squeezing of the opaque material into the finer branches of the bronchial tree which demonstrated that the cyanosis and dyspnea could not be responsible for the bronchial spasm produced in the previous series.

Series 3. In 4 dogs, after visualization of the main bronchi, a bilateral vagus section was made in the neck. None of the 4 dogs demonstrated evidence of bronchial spasm as seen in the first series.

Series 4. In 12 dogs, following visualization of the bronchi, atropine (1/75 gr.) was injected intravenously preceding the introduction of embolism. In 7 of the 12, evidence of bronchial spasm was not seen in subsequent films, but the drug failed to prevent this in the other 5 instances.

Series 5. In 9 dogs, atropine (1/35 gr.) was used in a similar manner as in the preceding series. Six of the 9 were protected from bronchial spasm.

Series 6. In 7 animals, papaverine (½ gr.) was used intravenously in a similar manner to the atropine used in the two preceding series. Four of the 7 animals were partially protected against bronchial spasm but the results were not as complete as with atropine. The action of the drug appeared to be slower than that of atropine.

Series 7. In 9 dogs a combination of atropine (1/75 gr.) and papaverine (½ gr.) was used. Only 6 were protected from bronchial spasm.

Clinical applications. These experiments demonstrate the effect of pulmonary embolism on the action of the bronchial musculature. Atropine (from 1/60 to 1/75 gr.) and papaverine (½ gr.) administered intravenously have been advised for emergency treatment when pulmonary embolism occurs. Oxygen is also indicated. The finding of patchy atelectasis in the presence of pulmonary embolism is thought to be due to vagal stimulation by pulmonary emboli. WILLIAM E. ADAMS, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Yodice, A.: New Sign to Differentiate Abdominal Muscular Rigidity in Cases of Acute Abdominal Conditions from That of Other Causes. *Am. J. Surg.*, 1942, 57: 457.

The author describes a method to establish the differential diagnosis between the muscular contraction from peritoneal reactions and that from other causes. Palpation is done with the patient in the dorsal decubital position with the thighs abducted and flexed to 90 degrees, and the feet resting on the bed or examining table. The index and middle fingers are introduced into the rectum to dilate the anal sphincter. At the same time, the left hand palpates the abdomen at the site of the muscular contraction. If at the moment that the dilatation of the anal sphincter is accomplished the muscular contraction of the abdomen does not disappear, it is a positive sign and denotes that the muscular contraction is due to peritoneal irritation (peritonitis). If during the introduction of the fingers which dilate the anal sphincter, the muscular contraction disappears, it is a negative sign and signifies that the contraction is due to pain of a colicky type, the treatment of which is not an emergency surgical procedure. The maneuver may be repeated many times until a clear interpretation is attained.

This sign serves to establish the differential diagnosis between the following syndromes:

1. Muscular contraction of the abdomen of inflammatory origin due to peritoneal infection (peritonitis), and a contraction produced by pain of a colicky type (intestinal, ureteral, gall-bladder, uterine).

2. Muscular contraction from peritoneal infection (peritonitis) and contraction of nervous origin induced by irritation of the nerves of the spinal column or periphery. The latter includes peripheral neuritis, wounds from firearms, or trauma of the spine. In these cases, especially in the wounds by firearms, the patient presents muscular contraction of the abdominal wall, in which case it is necessary to establish the diagnosis between intestinal perforation (defense reaction from peritonitis or peritoneal irritation) and reflex contracture from lesions of the nervous system (medulla or nerves).

3. Cases of "phantom" tumor produced by contraction of the abdominal wall or intestine, and of true tumor, neoplasm or new growth. When a phantom tumor is present, it disappears during the dilatation of the sphincter of the anus (negative sign).

Valuable information is also obtained by this test in cases of retroperitoneal tumor, aortitis, or aneurysm of the abdominal aorta, in which at times there is a muscular contraction of the abdominal wall. In cases of aortic aneurysm, the pulsation becomes less marked and the muscular contraction disappears at the moment the anal sphincter is dilated. The tumor diminishes in size. MANUEL E. LICHTENSTEIN, M.D.

River, L. P.: Spigelian Hernia. *Ann. Surg.*, 1942, 116: 405.

The linea semilunaris (spigelian line) is the line of transition between the muscle bundles and the aponeurosis of the transverus abdominis muscle. There have been 99 true cases of hernia through this area which have been reported. The author found 13 additional cases and adds 4 of his own. The hernial ring is lateral to the rectus margin and seldom above Douglas' fold, lying at the juncture of the middle and outer thirds of a line from the anterior superior spine to the umbilicus. Hernias here frequently are interparietal; they may not show any swelling, and may be symptomless. However, a localized point of tenderness in the abdominal wall, significantly at the site of the ring, can usually be found.

The author reports in detail his 4 cases and his method of repair, transverse imbrication of the ring margins. JOHN J. MALONEY, M.D.

Arthur, H. R.: Inguinal Hernia at an RAF Hospital. *Lancet*, Lond., 1942, 243: 387.

The prevalence of inguinal hernia in an RAF hospital in seventeen months is recorded as follows: 232 patients were admitted for radical cure and 199 were seen as surgical outpatients; of the latter 21 refused operation and were fitted with trusses.

The hernias were as follows: indirect 178 (77 per cent), direct 28 (12 per cent), recurrent 15 (6 per cent), and those associated with undescended and ectopic testicles 11 (5 per cent). The direct and indirect hernias were found in patients who had been afflicted therewith for a varying number of years. The last 2 types occurred after some unaccustomed exercise, or they had been completely unnoticed by the patient until discovered by the medical officer.

The patient with the undescended testicle ofter disregarded the hernia and was more concerned with the abnormal locality of the testicle.

The congenital sac in the first group was usually complicated by a weakened floor of the inguinal canal. In the second group (indirect hernia) the weakness of the floor of the canal dominated the picture, and the author stated that in a number of these cases the sac was not a true sac, internal to the deep epigastric artery, but a bulge of peritoneum between this artery and the internal abdominal ring which displaced the artery inward.

The recurrent types of hernia presented features of the congenital variety, and often occurred at the lower end of the scar, protruding through a gap between the insertion of the conjoined tendon and the lower attachment of the inguinal ligament.

The fourth group is always congenital and is treated as the first group. The basic principles are:

1. The dissection of the sac must be complete so that no part of the neck remains to be a starting point for a new sac.

2. The lowest part of the gap between the conjoined tendon and the inguinal ligament must be closed with the greatest possible care.

3. Special measures are necessary to secure firm union between the tendon and the inguinal ligament, simple catgut stitches being insufficient.

To these 3 principles the author adds that the normal anatomy of the part should be restored, rather than that an artificial buttress be produced which will stretch and weaken with advancing years. Adequate hemostasis is essential at each step of the operation.

The technique of the operation adopted by the RAF Hospital is as follows:

The usual inguinal incision is made and the external inguinal ring identified. The external oblique aponeurosis is divided in the line of its fibers and the inguinal canal laid bare. The edge of the conjoined tendon is dissected out and the cord freed, great care being taken to preserve both the ilioinguinal and iliohypogastric nerves. The sac is next identified, cleaned, transfixed, and ligated at the uppermost limit, and no part of the neck is allowed to remain; the stump is sutured to the deep surface of the transversalis muscle. Four No. 2 catgut sutures are now inserted between the conjoined tendon and the inguinal ligament, and after they all are in place they are tied, beginning with the lowest which is tied fairly tightly, and proceeding toward the internal ring where the last stitch is tied fairly loosely so that it will splint the conjoined tendon without putting undue strain on the muscle fibers. A strip is cut from the edge of the inner flap of the external oblique aponeurosis and is left attached to the pubic bone; this is now darned loosely between the inguinal ligament and the conjoined tendon so that it is under no tension, and it remains, in fact, a graft and is *not* used as a suture. The free end of this graft is then secured with a fine linen suture. The floor of the inguinal canal is next inspected and particular attention is paid to the extremities. The cord is allowed to fall back into position and the external oblique aponeurosis is sutured in the usual way with continuous catgut.

The difference between this operation and that described by McArthur lies in the insertion of the catgut sutures, which take up any strain to which the graft would otherwise be subjected in the postoperative period, and in the abandonment of the use of a second facial strip to close the external oblique aponeurosis. This is not necessary and only adds time to the operation; besides it makes a larger gap which has to be closed in the external oblique aponeurosis.

The postoperative period consists of fourteen days in bed, seven days in the ward, twenty-one days for sick leave, and twenty-eight days of light duty, the patient being back to full duty in ten weeks from admission to hospital. MATHIAS J. SEIFERT, M.D.

Veal, J. R.: Repair of Direct Inguinal Hernia with an Osteoperiosteal Transplant. *Ann. Surg.*, 1942, 116: 259.

Veal describes in detail a method of direct hernia repair which he first suggested in 1938. This consists briefly of suturing an osteoperiosteal transplant into the defect in the floor of Hesselbach's triangle, after excision of the sac. The removal of the graft from the tibia has not caused any disability or prolonged the convalescent period.

Sixty-eight consecutive cases repaired by this method have remained intact over a six-month period, but a longer period of observation and follow-up will be necessary for proper assessment of this procedure. J. M. MORA, M.D.

Waugh, R. L., and Hausfeld, K. F.: Femoral Hernia. A Simple Operation with a Report of Cases. *Am. J. Surg.*, 1942, 58: 73.

Simple excision of the femoral hernial sac through the femoral approach without an attempt to close the femoral canal, as advocated by A. J. Ochsner, has received little attention and has not been practiced to any great extent. However, the authors report their experiences with this type of operation, which they used in 12 of 15 patients subjected to surgical treatment. They point out that in the past sixty years more than 100 different surgical procedures have been advocated for the surgical cure of femoral hernia. In general there are four main types of repair, with two methods of operative approach, the femoral and the inguinal. Recurrence rates as high as 35 per cent have been reported by various authors. The high recurrence rate would seem to indicate that the distortion resulting from approximating various structures about the femoral ring does not always effect a cure.

They believe with Burrows that simple excision of the sac should be used in simple femoral hernia, in which the femoral ring has not been grossly distorted by past infection, trauma, or congenital anomaly; but that it should not be used in the presence of an abnormally large femoral defect or in strangulated hernia. The technique consists of making a transverse incision over the hernial sac under local anesthesia and freeing the sac from its surroundings. The sac is opened and the contents are returned to the abdomen. After determining that the sac is no longer adherent to the femoral ring, the operator applies gentle traction to the free end and ligates the neck by transfixion with plain catgut. The sac is then excised, and the peritoneal stump is observed to retract from the femoral canal. Any adipose tissue in or about the femoral canal is wiped away with plain gauze. The subcutaneous structures and skin are closed without any attempt to close the femoral canal. In strangulated or complicated femoral hernia, the inguinal approach and repair with fascial transplant is the procedure of choice.

The authors were able to follow up 10 of 12 patients operated upon with simple excision of the sac

for a period of from six months to two years; there were no recurrences. JOHN L. LINDQUIST, M.D.

Harkins, H. N., Szilagyi, E., Brush, B. E., and Williams, R.: Clinical Experiences with the McVay Herniotomy. *Surgery*, 1942, 12: 364.

The authors review their experiences with the McVay herniotomy and give an account of the technique employed.

The McVay operation is truly an application of the Lotheisen procedure applied to all types of inguinal hernia, whereas the procedure was first used in femoral hernias only. The operation is the result of extensive study of anatomical sections done between 1938 and 1940, which reveal that while practically all hernial repairs are based on the theory that the internal oblique and transversalis fibers normally insert into the inguinal ligament, this is not true. McVay concluded that the lowermost fibers of the internal oblique and transversalis muscles do not attach to the inguinal ligaments, but insert into the fibrous covering of the pubic pecten, the ligament of Cooper. He advised, therefore, suture of the inferior aponeuroses of the transversalis and internal oblique muscles to Cooper's ligament. While he was not the first to describe this operation, it was used only in the repair of femoral hernias. McVay broadened its use, and by a careful dissection of the inguinal region of more than 300 cadavers has placed the operation on a sound scientific basis. This is the authors' reason for referring to the procedure as the McVay herniotomy.

In the McVay operation the inguinal canal is opened in the usual way with meticulous care to prevent injury to the ilioinguinal nerve so often adherent to the undersurface of the external oblique aponeurosis. The cord and surrounding structures are separated from the lower leaf of the external oblique aponeurosis and Poupart's ligament, then from the region of the pubic spine and conjoined tendons, so that finally the cord is free except at both ends. The indirect sac, which is always present even in normal individuals, is located upward and medialward from the internal ring and is then opened, not only in indirect and combined types of hernias but also in simple direct or femoral hernias. If the indirect sac is long it is bisected, after a careful separation from the cord, near the internal ring. The distal segment is usually left undisturbed, but if it is easily separated it is removed. The proximal segment is grasped with Halsted clamps at points around the circumference of the internal ring. If a direct weakness or sac exists, the authors then transpose it laterally to the inferior epigastric vessels by the technique of Hoguet, which thus converts the indirect and the direct sacs into one. This is done by traction outward on the indirect sac, all of the peritoneum of the direct sac thus being pulled external to the vessel which readily converts the 2 sacs into one. The same procedure may be used to convert a femoral sac into an indirect sac. In some instances all 3 sacs may be converted into a single indirect sac. The indirect sac, whether it be simple or enlarged by the conversion, is then closed with an internal purse-string suture of No. 5 heavy silk. With the cutting of this suture the peritoneum snaps back and allows the defect in the transversalis fascia at the internal ring to come into view. The fascia is grasped with Allis clamps at numerous points surrounding the internal ring above and medially as far as the inferior epigastric vessels but not inferior to the cord, and a second purse-string suture is placed in the transversalis fascia. The inner layer of the anterior rectus fascia is routinely split for a distance of about 3 in., beginning at 1½ cm. above the pubic spine, upward and lateralward. The external oblique is lifted up by an assistant and the internal oblique is cut just lateral to the junction of the two to form the linea alba. The internal oblique is relaxed by undercutting it just lateral to the line of fusion with the external oblique to form the linea alba. This permits the internal oblique and the attached transversalis to be pulled down for the subsequent repair without tension. If, however, the transversalis alone appears strong enough, it alone is used as the upper leaf of the repair; otherwise the internal oblique aponeurosis must be included. In no case is "red" muscle used. The lower leaf is Cooper's ligament and it is identified by placing the left index finger on the anterior ramus of the pubis near the spine and moving it laterally along the crest until the femoral vessels are reached (5 cm. lateral to the spine). The first suture is placed medial to the finger and catches first the upper leaf of the transversalis fascia 4 cm. from the pubic spine, then through the thick Cooper's ligament on the upper border of the pubic ramus, the ligament being located by feeling the bone with the needle. Three or four similar sutures are applied between this suture and the pubic spine. The authors used a double strand of No. 5 heavy braided silk, tying the double strands three times, then separating them and tying the individual strands in pairs. In 80 cases, the external oblique aponeurosis was closed beneath the cord, while in 51 cases the cord was dropped into the space left by the McVay closure and the external oblique aponeurosis closed over it in a typical Bassini manner.

None of the cases operated upon by the authors was followed up longer than twenty-one months; 1 recurrence was observed. ANTHONY F. SAVA, M.D.

Dixon, C. F., Bargen, J. A., and Tennison, W. J.: Intraperitoneal Injection of Vaccine in the Prevention of Postoperative Peritonitis. *Arch. Surg.*, 1942, 45: 507.

A special study was set up which covered a period of two years in which vaccine was alternately administered in one case and not administered in the next, the cases in which vaccine was not given being intended to serve as controls. From this controlled series were excluded at the outset any cases considered unacceptable for vaccine treatment, for example, cases in which there was a large perforation. There were 480 patients included in the study

on whom, counting operations in multiple stages, 639 operations were performed; prior to 258 of these vaccine had been administered, and prior to 381 no vaccine had been administered. The postoperative hospital mortality rate was 10.2 per cent in the group without vaccine, and 7.0 per cent in the group which had had vaccine. If one considered only hospital deaths in which peritonitis had been found either clinically or at autopsy, the mortality rate for peritonitis was 6.6 per cent in the 381 operations prior to which no vaccine had been administered and 3.9 per cent in the 258 operations prior to which vaccine had been employed. Thus the mortality in the group for which no vaccine had been administered was about half again as large as in the group for which vaccine had been used. Comparison was made separately according to the type of operation and according to the surgeon, and in all comparisons made there was a consistent advantage for the group for which the vaccine had been used in about the same proportion as indicated for the over-all average results. It was concluded that the intraperitoneal administration of vaccine as described by the authors was of definite advantage in reducing postoperative hospital mortality rates following operations on the colon.

Certain of the statistics collected from previous results indicated that the postvaccinal rise of temperature is an indication of immunity to postoperative peritonitis. There was a definite decrease in the postoperative mortality rate among the patients whose postvaccinal temperature did not rise higher than 99.6° F. as compared to the mortality rate among the patients whose postvaccinal temperature exceeded 99.6° F. This indicated that the failure of temperature to exceed 99.6° F. after vaccination showed that the patient was relatively immune to postoperative peritonitis. The control study summarized in the preceding paragraph as well as the previously gathered statistics seems to show definitely that the vaccine produced an immunity in cases with temperatures not exceeding 99.6° F.

It was thought that if the failure of the postvaccinal temperature to exceed 99.6° F. was an indication of a relatively great amount of immunity, in a series of cases in which two doses of vaccine had been given several days apart prior to operation, those cases in which the postvaccinal rise of temperature after the second administration was less than the postvaccinal rise of temperature after the first administration would presumably be those in which a greater amount of immunity had been conferred by the first vaccination. If so, the postoperative mortality rate in this group should be less than in the group in which the patients had received two administrations of vaccine but in which the temperature after the second administration was higher than that in the first. This would indicate the active function of the first vaccination in conferring immunity, as well as corroborate the idea that the postvaccinal rise of temperature gave an indication of the degree of immunity conferred.

A series of such cases in which two vaccinations had been administered was available from previously accumulated data and an examination of the data showed that the postoperative mortality rate in the group in which the rise of temperature after the second vaccination was lower than that after the first was considerably lower than the postoperative mortality rate in the group in which the postvaccinal rise of temperature after the second vaccination was higher than that after the first.

The results just summarized suggested to the authors that the efficiency of intraperitoneal administration of vaccine in conferring immunity could be increased if, instead of a single administration prior to operation, more than one vaccination were utilized, and the procedure could be guided by the postvaccinal rise of temperature after the first vaccination. A plan that might be suggested, they said, is to include multiple intraperitoneal injections over a period of from six to eight days prior to operation.

The authors used a vaccine consisting of a sterile suspension of the escherichia coli and the green-producing streptococcus, but said that results of other studies indicated that other solutions injected intraperitoneally may also be effective against postoperative peritonitis. They asked that in any further controlled studies of this subject, it be kept in mind that other solutions than the ones they utilized might also be included.

GASTROINTESTINAL TRACT

Eusterman, G. B., Kirklin, B. R., and Morlock, C. G.: The Nonfunctioning Gastroenteric Stoma. Diagnostic Study of 62 Surgically Demonstrated Cases. *Am. J. Digest. Dis.*, 1942, 9: 313.

Delayed or late postoperative obstruction of the stoma usually is attributed to anastomotic ulcer or its complications. Successful differential diagnosis presupposes a thorough knowledge, whenever possible, of the symptoms and conditions existing before, during, and after the operation, especially with reference to whether or not an ulcer existed and whether gastrojejunostomy or some other type of operation was done. The authors said that in the absence of reliable information in relation to these points, the gastroenterologist, as well as the roentgenologist and gastroscopist, is thrown largely on his own diagnostic resources.

They did not find arrival at the diagnosis particularly difficult in the presence of unequivocal evidence of impaired gastric emptying, coupled with the knowledge that gastrojejunostomy had been performed previously. By the very nature of things the clinician could take it for granted that the stoma was not functioning properly. On the other hand, if information concerning essential details is lacking, the logical diagnosis in the majority of cases unwittingly would be "pyloric obstruction arising from duodenal ulcer."

It is desirable for the roentgenologist to be apprised of the fact that gastroenterostomy has been performed, for during an ordinarily brief period of examination barium may not pass through a fully patent stoma and may thus fail to disclose the anastomosis. It is also advantageous for the examiner to know who performed the operation, for he can better evaluate his observations if he is familiar with the particular surgeon's methods. The roentgenological technique should follow the usual routine, and only a few swallows of the barium suspension should be given to the patient at first, so that mucosal relief and the stoma will be exhibited satisfactorily. Thereafter, larger amounts of the mixture can be given as needed. Chief among roentgenological signs of a nonfunctioning or poorly functioning stoma is, of course, failure of the barium mixture to pass through the opening, or passage of it in an obviously inadequate volume. In corroboration of this sign, the cause of it may be demonstrable as gastrojejunitis or an ulcer situated at or near the anastomosis; again, the situation of the stoma too high or too low in the stomach may be rather confirmatory. However, complete failure or inadequacy of the stoma to perform its function always should be established thoroughly; otherwise errors are bound to result. Often, during the first minutes of examination, barium cannot be seen passing through the stoma, although the stoma is functionally competent. To clarify such uncertainty, the patient should be permitted to relax before the examination is continued, and the examiner should repeat his inspections until he is satisfied, or he should request reexamination later. Indeed, it is seldom safe to base a definite diagnosis of nonfunctioning stoma on the results of any single examination, but a high degree of reliance can be placed on the opinion if the test in question is repeated and reasonable care is exercised. On the other hand, ready passage of barium in adequate quantity through the stoma is conclusive evidence that the anastomosis is functioning properly. The fact that the barium is passing through the stoma must be ascertained carefully by the examiner, for when the pylorus is not obstructed the barium in the stomach merges with that in the loop of bowel at the site of the stoma, whether the latter is functioning or not. By pressure on the proximal loop of bowel, deception can be excluded. Whenever the roentgenological data are incompatible with the clinical facts, the examinations should be repeated or results of them recanvassed until they harmonize.

The patients in this series of 62 surgically demonstrated cases came under our observation during the period from 1924 to 1941. They were selected on the basis of a roentgenological diagnosis of nonfunction of a gastroenteric stoma. More than three-fourths of the patients had been operated upon elsewhere, originally. Fifty-four of the patients (87 per cent) were males, and 8 (13 per cent) were females.

The symptoms and signs in a little more than three-fourths of the patients (77 per cent) were typical of those which characterize ulcerative or inflammatory anastomotic lesions, in addition to those engendered by reactivation of the original ulcer. There was also the added clinical feature of gastric motor impairment in 77 per cent of the 62 cases. In those patients in whom the obstruction was marked, toxemia, malnutrition and even tetany were often manifest. About a third of the patients had pains of greater intensity than those that had been experienced originally. Moreover, the pains were less amenable to relief by the usual measures and frequently shifted downward to the left abdominal quadrant. Extension of pain to the back and hypogastric area was not uncommon. In such cases the titer of the gastric contents was usually high. This combination of symptoms and signs is characteristic of subacute perforating jejunal ulcer, and diagnosis of such a lesion usually was verified at operation.

Next in frequency and importance was a somewhat similar group of signs and symptoms in which pain was less marked and was more inclined to be localized than was the pain in the first group. The symptoms had a tendency to reduplicate the original ones. However, frequent shift of the pain to a lower anatomical level and hemorrhage were features of the second group, in common with those of the first. In the second group the surgical observations were uncomplicated marginal ulcer or gastrojejunitis.

A third group of signs and symptoms was characterized by obstruction of a mechanical nature and the patients had a rather nondescript type of preoperative history and early postoperative symptoms of a stormy, obstructive nature. Achlorhydria or hypochlorhydria was present in 7 of the 8 cases in which intubation was carried out. Such a combination of low values for gastric secretion and obstruction seems characteristic of patients who have mechanical blockage of a gastroenteric stoma.

The late occurrence of hemorrhage after gastrojejunostomy performed for duodenal ulcer when there is no history of preoperative hemorrhage usually is significant of an ulcerative or inflammatory process at a site other than that of the primary lesion. Such hemorrhage was recorded in 17 patients of this series. It was found to have originated in an anastomotic lesion in 15 instances and in diffuse hemorrhagic gastritis and gastric ulcer, respectively, in the remaining 2 instances. Another clinical feature which served to raise a strong suspicion of the ulcerative or inflammatory nature of the anastomotic lesion as the cause of nonfunction of the stoma was the early recurrence of symptoms after gastrojejunostomy.

In a total of 48 cases, or 77 per cent, an ulcerative or inflammatory lesion, or both, was found, In 8 patients the obstruction was either solely or predominantly mechanical, because of "twisting of the gastroenterostomy on itself" in 3 cases, improperly placed and originally too-small stoma in 4 cases, and the performance of long-loop anterior gastroenterostomy and the subsequent extensive formation of adhesions in 1 case. In 6 cases the condition was classified as physiological dysfunction. In this

group the surgeon had found the stoma to be open, without evidence of ulceration or inflammation. In 3 cases, however, the presence of an associated penetrating or perforating gastric ulcer was noted.

Miller, G. G.: Report on 230 Cases of Subtotal Gastric Resection for Peptic Ulcer. *Surgery*, 1942, 12: 383.

The author reports the cases of 230 patients who were operated upon during the course of the past five years for various types of ulcer: simple, penetrating, perforated, stenosing, gastric, duodenal, stomal, and jejunal. Included, also, were ulcers complicated by gross and massive hemorrhage. There were 7 postoperative deaths, a mortality of 3 per cent. The average duration of symptoms was eight years with the condition persisting in spite of medical treatment.

Eighty-five per cent of the patients have been followed up either by questionnaire or personal observation. Death occurred in 4 cases because of the following conditions: tuberculosis, 1; lymphosarcoma, 1; Krukenberg's tumor with liver metastases, 1; and cerebral hemorrhage, 1. In the cases of 2 patients, autopsy showed no recurrence of the ulcer one and three years after operation. The 2 other patients remained symptom-free up to the time of their death, one and six years after operation. Of the remaining patients who were followed up, it is estimated that 90 per cent were cured and 10 per cent were benefited.

The majority of patients, though adequately nourished, do not gain weight very easily. It has been the author's experience that not infrequently a few residual complaints remain for a few months following this operation. Patients complain of hot flushes after drinking liquids, belching after meals, occasional nausea, and, occasionally, anemia. Although some patients find it difficult to gain weight, as time passes the small stomach adapts itself to the work and the patients gradually lose their symptoms.

The following types of ulcer were seen in these patients: duodenal ulcer, 125; gastric ulcer, 50; pyloric ulcer, 17; and jejunal ulcer, 19; in 7 cases the condition was doubtful. Both gastric and duodenal ulcers occurred in 4 patients, and the gastric ulcers were found to be malignant in 3 cases.

Resection for perforated ulcers was done in 11 cases. There was 1 death from pulmonary embolus. The author believes that resection is technically feasible in the cases of early perforations (under twelve hours); it will prevent further recurrence of the ulcer and the necessity of a second operation, and the mortality will be low. Because of the thickened inflammatory wall of the duodenum the operation is more difficult at the time of perforation and should not be advocated for routine use.

Experience with early resection for gross and massive hemorrhage has been most encouraging. In the cases of 10 resections for massive hemorrhage, in which immediate operation appeared to be indicated, there were no deaths. Cases of massive hemorrhage refer to those patients with persistent bleeding, collapse, falling blood pressure, and low hemoglobin. All of the deaths, except 2 due to pulmonary embolus, occurred in patients with penetrating ulcer, the most severe type of all ulcer lesions. If the patient with massive hemorrhage is under forty-five years of age, the rule is to wait for the bleeding to stop within the first forty-eight hours. If the patient is over forty-five years of age, almost immediate surgical intervention is advocated, since, under this regimen, the mortality will approximate 35 per cent.

Resection appears to be the best method of operation. Following operation there is a tendency for fluids to pass rapidly out of the stomach into the jejunum, which may occasion a hot flush; or a feeling of faintness in the patient during the early postoperative months. The patients should be advised to eat solid foods at the beginning of their meals, and it is also wise for them to eat between meals and at bed time. All patients are advised to take iron and liver for the first few months following operation to avoid a secondary anemia. The vitamin intake must also be adequate. Recently, the author made tests for Vitamin C deficiency in the urine. These tests showed that 54 per cent of his patients with ulcer were deficient in this vitamin. It appears that less infection and better wound healing takes place in cases in which Vitamin C is adequately supplied.

The average physician still fears the high mortality and high rate of recurrence in patients following resection for ulcer. The low mortality of 3 per cent in this series should help to dispel this apprehension. Usually, patients spend about two weeks in the hospital, and are able to return to work after a period of one month. JOHN W. NUZUM, M.D.

Doehring, P. C., and Eusterman, G. B.: Association of Pernicious Anemia and Carcinoma of the Stomach. *Arch. Surg.*, 1942, 45: 554.

The authors said that before the introduction of liver therapy in 1926, the average duration of life after the onset of pernicious anemia was five years and the majority of persons afflicted with the disease were dead after three years. This short interval did not permit the development of many complications. At post-mortem examination of subjects who had died of pernicious anemia, however, carcinoma of the stomach frequently was encountered.

In 26 of the 40 cases the diagnosis of pernicious anemia preceded the diagnosis of gastric carcinoma; in only 2 cases did the diagnosis of carcinoma precede the diagnosis of pernicious anemia and in 12 cases the onset of the two diseases appeared to be simultaneous.

Although the number of patients suffering from pernicious anemia seen at the Mayo Clinic each year has increased only gradually, the number of cases in which pernicious anemia is associated with carcinoma of the stomach has increased markedly. For many years at the clinic annual routine roentgeno-

logical gastric studies have been advised in all cases of pernicious anemia on the assumption that an increasing number of carcinomas of the stomach would be disclosed. That this measure has been justified is evidenced by the fact that in 9 such cases observed in 1939 carcinoma of the stomach was diagnosed.

During the five-year period from 1935 to 1939, inclusive, approximately 1,014 patients who had pernicious anemia were treated at the Mayo Clinic. Of this number, 17 (1.7 per cent) had carcinoma of the stomach also. A study of these 17 cases forms the basis for the authors' report.

The authors believe that apparently the incidence of carcinoma of the stomach among persons afflicted with pernicious anemia is increasing, but whether the increase has any relation to the pathological processes concerned in pernicious anemia or is due merely to the fact that today more patients who have pernicious anemia are living longer into the cancer age as the result of liver therapy than did patients of this type formerly, is impossible to say at present.

In the five years from 1935 to 1939, inclusive, gastric resection was performed at the Mayo Clinic in 575 cases for malignant disease. In 17 of the cases the lesions were sarcomas, and in 14 cases resection was total. These 575 resections represent approximately half of the operations performed in that period for malignant disease of the stomach.

Doehring and Eusterman observed that because carcinoma of the stomach may occur and even be far advanced without producing any symptoms other than those of mild, vague indigestion, it is difficult to state in all cases just when the onset of symptoms referable to the carcinoma occurred. In their study the average age at the onset of symptoms of pernicious anemia was fifty-four and five-tenths years, whereas that at the onset of symptoms thought due to carcinoma was sixty-three and two-tenths years. The average interval between the two diseases was eight and seven-tenths years, an interval much greater than the average survival period of patients who had pernicious anemia in the days before liver therapy. The increased period of survival probably accounts in part for the present increasing frequency of gastric carcinoma in association with pernicious anemia.

All of the 17 patients in this study had achlorhydria; in 10 it was demonstrated from three to twenty-four years before the discovery of the carcinoma. In 1 patient achlorhydria was detected fifteen years before the onset of pernicious anemia and twenty-four years before the discovery of carcinoma of the stomach, when the patient had attained the age of sixty-three years.

In 12 of the 17 cases of associated pernicious anemia and carcinoma of the stomach which form the basis of this report, operation on the stomach was attempted, but in 5 the growth was found to be inoperable. In 3 of the 5 cases in which operation was not performed, the carcinomas were judged inoperable on the basis of roentgenological examination; in the fourth case the patient refused operation, and in the last case the carcinoma was discovered at autopsy, although the results of roentgenological examination of the stomach made a short time before death were negative. In 2 of the 7 cases in which surgical treatment was carried out local excision of polypoid growths was done, and in the 5 others partial gastrectomy was done.

The carcinoma was located in the lower third of the stomach in 8 cases (47 per cent), in the middle third in 4 cases (23.5 per cent), in the upper portion in 3 cases (17.6 per cent), and the whole stomach was involved in 2 cases (11.7 per cent). Microscopic studies were done on the material obtained from the 7 cases in which surgical treatment was given, at biopsy in 2 of the cases of inoperable lesions, and in the case in which carcinoma was discovered at necropsy. All the lesions proved to be adenocarcinomas.

Among the 1,014 patients observed from 1935 to 1939, inclusive, who had pernicious anemia, there were 4 who had gastric polyps which were considered benign, an incidence of 0.39 per cent.

Doehring and Eusterman thought a possible relationship between pernicious anemia and carcinoma of the stomach was indicated by the fact that both diseases most frequently occurred among persons more than forty years of age, although the average age of patients who had pernicious anemia was slightly less than that of patients who had gastric carcinoma. Achlorhydria also is common to both conditions but it should be regarded as a symptom rather than as a clinical entity. Chronic gastritis, especially the atrophic form, or gastric atrophy, frequently is associated with both pernicious anemia and gastric carcinoma, although its presence is not essential for the development of either.

The authors concluded that although present evidence is insufficient to prove a direct relationship between the two diseases, there are grounds for suspecting that persons who have pernicious anemia are slightly more likely than normal persons to have gastric carcinoma.

Raven, R. W.: Inoperable Gastric Cancer. Treatment with Radon Seeds. *Lancet*, Lond., 1942, 243: 335.

As cancer affects the stomach more commonly than any other organ, the management of gastric cancer is an important surgical problem. In an investigation by the author, it was found that 77 per cent of 187 consecutive patients presented themselves at a stage when radical surgical extirpation was impossible and only palliative treatment was possible.

This article discusses the management of a group of patients in which the disease was advanced. The method of treatment relieves the symptoms, and in many cases prolongs the lives of patients who are unsuitable for gastrectomy. In most of the patients, the growth was in the proximal half of the stomach,

and it is known that some neoplasms in this region are radiosensitive.

Technique of interstitial irradiation. The size and shape of the neoplasm is measured after surgical exposure and the amount of radon estimated by the physicist in attendance at the operation; he will also show the appropriate sites for the implantation of the radon seeds.

A left paramedian incision is advisable when the lesion is in the proximal half of the stomach. The site, size, shape, and extensions are determined through an adequate exposure so that a correct assessment of the number of radon seeds required can be made. Souttar's radon-seed introducer is pushed obliquely through an area of normal stomach wall near the lesion, and radon seeds are inserted around the growing edge of the carcinoma. When the cardiac orifice is involved seeds are inserted in this area. Throughout the body of the tumor, seeds are implanted 1 cm. apart. For growths approximately 12 by 10 cm., 30 radon seeds of 2 mc. each are required. After insertion of the seeds, the abdomen is closed in layers without drainage. A roentgenogram is taken to locate the seeds.

Due to the position of the stomach and the close proximity of other vital organs, irradiation here is attended by greater dangers than in the breast, mouth, or cervix uteri. Radiation sickness is common after irradiation of the upper abdomen. A moderate fever may develop because of the increase of local infection in the neoplasm, but it quickly subsides. There may be a secondary anemia and a severe leucopenia. Leakage of the stomach contents through the radon-seed introducer may give rise to acute diffuse peritonitis, but if the introducer is inserted at an acute angle to the stomach wall so that the seromuscular coat is penetrated obliquely for some distance, this risk is minimized. Radionecrosis with extensive sloughing of the neoplasm may result and lead to hemorrhage from the stomach or perforation into the peritoneal cavity.

Of 34 patients with the expectation of life of three months, 2 are still surviving, 1 three years, and 1 seven months after treatment; 3 of the whole series survived for more than a year, 14 survived between four and nine months, and 17 died within three months of treatment. ALFRED B. LONGACRE, M.D.

Riley, I. D.: Perforated Peptic Ulcer in Wartime. *Lancet*, Lond., 1942, 243: 485.

"In the Royal Victoria Infirmary there were 200 ulcer perforations in 1939, 222 in 1940, and 251 in 1941. This rise coincided with a small fall in the total number of surgical admissions. Figures for 1926, the year of the general strike, showed no comparable rise. During periods in which air-raids were frequent in London, Bristol and Liverpool, an increase occurred by a third to six times the usual number of cases, whereas during months without air-raids the figures were normal. Air-raids had a less obvious effect in Newcastle than in these other cities, probably because the bombing was less severe. The average number of perforations during months in which raids took place was 19, compared with a monthly average throughout the whole of 7 years of 17. The number of perforations in January was always consistently high, the average being 26. The totals for the Royal Infirmary were as follows.

Year	Perforations	Total surgical admissions	Average age
1926	186	7,192	40
1931	156	6,931	42
1937	181	6,862	42
1938	198	6,909	44.1
1939	200	6,785	41.4
1940	222	6,418	42.5
1941	251	6,181	42.2

"The cause of this progressive increase is not easy to determine. There has been a change in the last 40 years, both in the site of the lesion and in the type of patient whose ulcer perforates. In 1900 young women frequently suffered from perforations on the lesser curvature, whereas during the last 20 years perforation of ulcers in the pyloric region in men aged about 40 years has been common and young women have rarely been affected. In the Newcastle series the average age was 42 years. This suggests that the increase is not due to those factors which caused perforations in young women 40 years ago.

"Other factors which aggravate ulcers are worry, bad dietary habits and overwork. Real anxieties, not trivial cares, aggravate the symptoms and some grave domestic crisis often precedes perforation. The young are more liable to be disturbed by uncertainties of employment than the middle-aged, who are chiefly concerned with social position and financial security. Uncertainty of employment is increased during war-time.

"Four cases of adult scurvy were present in Newcastle wards in July, 1942. Since perforations increased tenfold during famine in Russia this may mean that malnutrition is also a factor in the present increase. The conditions under which food is served and eaten are more important than its nutritive value. Long hours of work with hasty sandwich meals, at irregular intervals, were the cause of much gastric disorder in London Transport workers, as shown by the Royal Commission's report on the causes of the 1937 strike.

"Despite statements that the health of the nation is better than it has ever been before, there is evidence that digestive disorders and perforation of peptic ulcers have become more common. Perhaps shorter hours of work and improved canteen facilities would result in less time being lost on this account.

"I wish to thank the hospital registrar for the figures, and Dr. C. J. Polson for his help."

(ORIGINAL ARTICLE.)

Henry, C. M.: The Peritoneal Fluid and Gastric Contents in Cases of Perforated Peptic Ulcer. *Arch. Surg.*, 1942, 45: 564.

Henry states that bacterial infection of the peritoneal cavity is a major cause of death in cases of per-

foration in peptic ulcer. Micro-organisms are to be found in the peritoneal cavity soon after a perforation of an ulcer. The gastric acidity is low at the time of perforation and bacteria are to be found in the gastric contents. The peritoneal fluid obtained at operation on patients with perforation has a hydrogen-ion concentration and a chloride content approaching that of blood plasma.

J. M. MORA, M.D.

Berk, J. E., Rehfuss, M. E., and Thomas, J. E.: Duodenal-Bulb Acidity under Fasting Conditions in Patients with Duodenal Ulcer. *Arch. Surg.*, 1942, 45: 406.

The most susceptible of the areas subject to the ulcerating influences of the acid gastric juice is the first part of the duodenum. There is little information available regarding the acidity in this important ulcer-bearing region, in marked contrast with the extensive studies made on acidity in the stomach. This study was undertaken to obtain data on the acidity in the duodenal bulb under fasting conditions in patients with an ulcer at that site, for comparison with data obtained during digestion in the same subjects and with data from fasting normal subjects. The 26 patients studied were selected at random from the wards and the outpatient gastrointestinal clinic of the Jefferson Medical College Hospital, Philadelphia, Penn. All presented symptoms suggestive of an active ulcer; some had a history of episodes of bleeding, and all showed an active nonobstructive duodenal ulcer without any recognizable lesion in the stomach when examined roentgenologically. A few were examined additionally with a gastroscope and showed a normal gastric mucosa. Experiments were considered technically satisfactory in 23 of the subjects (17 males and 6 females), and only the results from these were accepted. The age of the entire group ranged from twenty-one to fifty-seven years with an average of forty and seven-tenths years; the female subjects, from twenty-one to fifty-nine years with an average of forty-four and two-tenths years.

It was found that under fasting conditions, the contents of the first part of the duodenum in patients with duodenal ulcer are more acid than in normal subjects. In fasting patients with ulcer, they have an average pH of about 3.9. During fasting, free acid is found more often in the contents of the first part of the duodenum in patients with an ulcer in that situation than it is in normal subjects. Free acid when present in the duodenal-bulb contents in fasting patients with ulcer tends to persist for longer periods than in normal persons. The ability of the contents of the duodenal bulb in fasting patients with ulcer to neutralize, buffer, and dilute the gastric secretions is impaired but not wholly lost. The impairment is probably largely due to gastric hypersecretion, but a defective neutralizing capacity in the duodenal bulb seems to be present as well. The neutralizing capacity of the contents of the duodenal cap in patients with ulcer under fasting conditions appears to be as good or better than during digestion of an Ewald meal. There is no constant parallelism in the behavior of the simultaneously determined gastric and duodenal bulb acidity.

MANUEL E. LICHTENSTEIN, M.D.

Clute, H. M., and Sprague, J. S.: The Place of Gastroduodenostomy in the Surgery of Duodenal Ulcer. *N. England J. M.*, 1942, 227: 508.

The general consensus of medical opinion is that simple duodenal ulcer is primarily a medical problem, and it is well known that from 80 to 90 per cent of duodenal ulcers can be satisfactorily managed by medical treatment. However, when complications occur in duodenal ulcer surgery becomes necessary. The chief complications demanding surgery are acute perforation, hemorrhage, pyloric obstruction, and failure of medical measures to give satisfactory relief.

In past years the majority of surgeons utilized gastroenterostomy for complicated duodenal ulceration. Although lasting relief was obtained in many patients, it became increasingly evident that the frequency of gastrojejunal ulceration following posterior gastroenterostomy was great and that this lesion was more serious than the original ulcer. Surgical opinion has turned more and more to subtotal gastrectomy as the procedure of choice in complicated ulcers. It is believed that a resection of two-thirds or more of the stomach and including the pylorus is best in the treatment of complicated duodenal ulcers.

The author has now performed 26 gastroduodenostomies for the complication of duodenal ulcer with 1 death. Of these, 24 have been followed up to date. In 16 cases of organic pyloric stenosis the results have been so entirely satisfactory that the author has been greatly impressed with the value of the operation in this condition. Two patients with bleeding gastrojejunal ulcers were treated by resection of the jejunal ulcer and closure of the jejunum and stomach; a gastroduodenostomy instead of a gastric resection was done because of their condition. Both patients have remained well for many years. In the author's experience, gastroduodenostomy is more easily performed than posterior gastroenterostomy, and certainly the patients have a smoother postoperative course.

No gastrojejunal ulceration has followed gastroduodenostomy in this series of patients thus far. This would appear logical, since in gastroduodenostomy the acid gastric secretion empties directly into the duodenum, which is prepared by Nature for it, rather than into the jejunum, which is not.

JOHN W. NUZUM, M.D.

Poth, E. J.: Succinylsulfathiazole. *J. Am. M. Ass.*, 1942, 120: 265.

The ideal intestinal antiseptic should be poorly absorbed from the alimentary canal and should possess strong antibacterial local action. Moore and Miller have recently synthesized such a com-

pound with properties approximating these specifications. This drug has been used for about one year and studies have been made on about 250 patients. All cases have been studied closely for evidence of hemocytological changes and accumulation of the drug in the blood stream. The total quantity of the drug excreted in the urine was determined in the majority of the cases. The alteration in the intestinal flora was assayed by quantitative studies along bacteriological lines. Within from one to seven days of the institution of sulfasuxidine therapy the feces became semifluid, small in bulk, somewhat gelatinous in appearance, and relatively odorless.

When these changes occur, the bacterial flora of the bowel will have been considerably altered. The escherichia-coli count will have dropped from an average of 10,000,000 to less than 1,000 organisms per gram of wet stool. Both the Gram-positive and Gram-negative organisms decrease in number at approximately the same logarithmic rate for a few days until the Gram-positive population becomes constant. The number of Gram-negative bacteria continues to fall. The drug has both bactericidal and bacteriostatic action.

During the past six months the following regimen has been instituted for the preoperative preparation of all patients whose intestine is not completely obstructed and who require operation on the large bowel:

The patient is put on a low residue diet and receives succinylsulfathiazole. A dosage of 0.5 gm. per kilogram of body weight is given during the first day and thereafter 0.25 gm. per kilogram divided into 6 equal doses and administered at four-hour intervals is given daily. No enemas or purgatives are used. Ordinarily after from three to seven days the stools will become small in bulk, semifluid, and relatively odorless. The bacterial flora will be significantly altered. The patient's abdomen is flat and the bowel free from gross fecal material and gas. When the escherichia-coli count has dropped to 1,000 and other changes in the feces have taken place, the bowel is regarded as properly prepared for operation.

A dogmatic evaluation of the benefit resulting from the administration of this drug in the preoperative and postoperative therapy of patients subjected to operative procedures on the large bowel cannot be arrived at after only one year of use on a total of 50 patients. However, the study indicates strongly that the postoperative course is unusually smooth, that serious complications due to infection following fecal contamination are largely eliminated, and that the period of hospitalization and convalescence is definitely shortened. The toxicity of the drug is slight. There is no evidence of kidney damage. No deaths occurred following primary suture of the large bowel in the 30 cases included in this study. Two deaths have occurred following abdominoperineal resection of the rectum. In 1 instance, the blood supply to the distal 6 in. of the descending colon was insufficient with resulting necrosis of this segment. In the second case, anuria developed postoperatively and autopsy revealed that both ureters were blocked by a large perineal pack left *in situ*. JOHN W. NUZUM, M.D.

Duley, W.: Acute Appendicitis. An Analysis of 417 Consecutive Cases. *Am. J. Surg.*, 1942, 58: 40.

The author reports a mortality of 14.2 per cent in 70 cases of ruptured appendicitis with spreading peritonitis, and of 8.5 per cent in 47 cases of ruptured appendicitis with abscess formation. There were no deaths in 300 cases of unruptured acute appendicitis.

A statistical analysis is made of 417 cases of acute appendicitis which were admitted to the surgical service of the Knickerbocker Hospital, New York, New York. The method of treatment included early operation for unruptured acute appendicitis, and delay in operation in ruptured cases until the fluid and electrolyte balance could be restored. The McBurney incision was preferred in most cases. There was a tendency to use fewer drains intraperitoneally in the unruptured cases, but rather to drain the wound down to the peritoneum. Intraperitoneal drainage was still used for cases of ruptured appendicitis. Sulfonamides were used in the ruptured cases; they were given by mouth, rectum, or intramuscular injection, but they were not used intraperitoneally.

A statistical review of the symptomatology was given with emphasis on the duration of symptoms and the history of catharsis or enemas. The complications were listed and a brief report was given of each fatal case. EDWARD W. GIBBS, M.D.

Hopping, R. A., Dockerty, M. B., and Masson, J. C.: Carcinoid Tumor of the Appendix. Report of a Case in Which Extensive Intra-Abdominal Metastases Occurred, Including Involvement of the Right Ovary. *Arch. Surg.*, 1942, 45: 613.

The authors said that whereas carcinoid tumors of the stomach, small intestine, and colon frequently are classed as being malignant, tumors of an exactly similar nature occurring in the appendix are regarded as being essentially benign. However, they noted that recorded instances of no less than 16 metastasizing appendical carcinoids bear witness to the fact that these seemingly innocent neoplasms are capable of widespread dissemination.

Carcinoids of the appendix are found among patients of various ages, including those in childhood as well as those in senility; the authors' patient was 47 years old. All three germ layers have been variously considered to be the source of the tumor cells or their antecedents. Probably most widely accepted now is the concept of entodermal origin. The question of the malignancy of these tumors has been argued, pro and con, for almost forty years. When they occur in the stomach and large intestine, almost all of them are deemed malignant. Pathologically, serosal involvement is frequently observed but metastasis is rare. When it does occur, it is usually local in the mesenteric fat, the regional lymph nodes, and, more rarely, the liver.

The authors said it had been their constant observation that carcinoids, regardless of size, point of origin, or presence or absence of metastasis, possess essentially the same microscopic features of cytological differentiation and histological architecture. Origin from, and differentiation into, glandlike structures has been noted frequently. The authors, therefore, share with many the belief that all of these tumors are adenocarcinomas of Grade 1 malignancy (Broders), but they do not believe it would be wise to discard the designation "carcinoid" for this type of tumor. The diagnosis "Grade 1 adenocarcinoma (carcinoid)" appears to them to be accurate, to designate a specific entity, and to separate this entity from the ordinary adenocarcinoma which has a somewhat worse prognosis.

Jones, T. E.: Complications of One-Stage Abdominoperineal Resection of the Rectum. *J. Am. M. Ass.*, 1942, 120: 104.

Jones reviews the complications following one-stage abdominoperineal resection of the rectum for carcinoma, in a consecutive series of 500 cases.

Parotitis occurred infrequently (5 per cent). The author has not been greatly impressed by radiotherapy; he advises simple conservative measures, and when suppuration occurs, incision and drainage.

The pulmonary complications, while few in number, were directly related to the incidence of postoperative wound infections. When the incidence of wound infection in the early cases dropped from 28 to 1 per cent, the frequency of pulmonary complications dropped proportionately. Jones does not attribute the better results entirely to the use of the sulfonamide drugs.

The incidence of peritonitis, once foremost among the complications, has been greatly reduced, since the author has substituted interrupted alloy-steel-wire sutures for catgut, and used simple clip-skin closure with elimination of the stay sutures. This complication, too, seemed directly related to the incidence of wound infection. Jones has used neither intraperitoneal vaccine nor intraperitoneal sulfanilamide. The pointed statement is made that drugs can never replace meticulous surgery.

Paralytic ileus was uncommon and death from hemorrhage occurred but once.

The most distressing complications were those due to urinary-tract infection. In these cases, the use of the sulfonamide compounds has greatly reduced the severity and duration of the infection.

Epididymitis, ureteral damage, prolapse of the bowel loops through the pelvic floor, and late obstruction were rare complications. Ninety-five per cent of the patients became impotent.

J. M. Mora, M.D.

Kay, E. B.: Regional Lymphatic Metastases of Carcinoma of the Gastrointestinal Tract. *Surgery*, 1942, 12: 553.

The purpose of this article is to compare the gross and microscopic characteristics of carcinoma of the gastrointestinal tract to the incidence of regional lymph-node metastases. This study is based upon the dissection and examination of all the lymph nodes from 152 operative specimens of carcinoma of the gastrointestinal tract, including 53 gastric, 46 colonic, and 53 rectal specimens. The lymph nodes were dissected from each specimen after they had been visualized by clearing with the Gilchrist and David modification of the Spalteholtz method.

An average of 30.2 nodes per specimen was isolated in the gastric, 52 in the colonic, and 67 in the rectal series. A considerably larger number of lymph nodes per specimen was obtained in this way than is possible by the usual method of manual dissection. An incidence of lymphatic metastases of 75.5 per cent was found in the gastric group, 60 per cent in the colonic group, and 64.2 per cent in the rectal group.

The view that neoplasms in the younger age groups tend to have a higher incidence of metastases was substantiated by this study. There was no relation between the duration of symptoms and the presence of lymph-node metastases. A comparison of the incidence of lymphatic metastases in carcinoma of the gastrointestinal tract classified according to gross characteristics showed that the sessile neoplasms had a much greater tendency to metastasize than the polypoid neoplasms. In the polypoid group there was an incidence of metastases of 60 per cent in the stomach, 57.5 per cent in the colon, and 80.9 per cent in the rectum, while in the sessile group there was an incidence of metastases of 95.4 per cent in the stomach, 83.3 per cent in the colon, and 80.9 per cent in the rectum. There was no relation between the size of the neoplasm and the presence of metastases; the smaller neoplasms had just as high an incidence of metastases as the larger ones were found to have.

The authors' studies substantiated the dictum that the more anaplastic the neoplasm, the higher the incidence of lymphatic metastases. The medullary adenocarcinomas and the adenocarcinoma mucosum had the highest incidence of metastases, while the adenocarcinomas (simplex) and the papilliferous adenocarcinomas had the lowest incidence of metastases.

Joseph K. Narat, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Taylor, W. B.: Internal Biliary Fistulas. *Canad. M. Ass. J.*, 1942, 47: 332.

The common cause of an internal biliary fistula is the presence of biliary calculi. Such oddities as fistulas between the gall bladder and a pregnant uterus, between the gall bladder and an ovarian cyst, and between the gall bladder and the vagina have been reported. Fistulas between the common and hepatic bile ducts and the portal vein, between the bile passages and the pleura, and between the bronchi and the pericardium have occurred. Gall stones have been coughed up, vomited, and passed by way of the rectum.

The most common etiological factor leading to biliary fistula is the presence of gall stones. However, fistulas have been reported as being due to such foreign bodies lodged in the biliary system as swabs, thread, bristles, gauze, fruit seeds, a cherry stone, a steel needle, wire, a handle of a spoon, and a blade of a hemostat. Internal biliary fistulas may also result from surgery on the gall bladder and bile ducts.

The diagnosis of such fistulas is made during a barium-meal or barium-enema examination. There is nothing particularly diagnostic about the history. The most frequent clinical symptom is intestinal obstruction by a gall stone. This usually signifies a cholecystoduodenal fistula.

The author reports 6 cases of internal biliary fistula. The ages of the patients ranged from thirty-nine years to seventy-eight years with only 1 patient under sixty years of age. One case was diagnosed by means of the x-rays alone, 2 were diagnosed by means of the x-rays and proved at operation, 1 was found at the time of operation, and 2 were found at autopsy. EARL O. LATIMER, M.D.

Elkeles, G., and Mirizzi, P. L.: A Study of the Bacteriology of the Common Bile Duct in Comparison with the Other Extrahepatic Segments of the Biliary Tract. *Ann. Surg.*, 1942, 116: 360.

Bile from the common duct was removed through the wall of the duct only in cases in which choledochotomy was to be performed. In the majority of cases it was obtained by introducing a cannula with an olive-shaped tip through the stump of the cystic duct. One or two cubic centimeter specimens of this bile were then aspirated. This procedure has the advantage that it eliminates the possibility of damaging the wall of the common duct.

In addition to the bile from the common duct, specimens of bile from the gall bladder and from the duodenum in all of the cases, as well as a piece of the wall of the gall bladder were obtained.

The following conclusions were drawn:

1. Bile from the common duct is sterile in a large number of patients with disease of the extrahepatic bile ducts. In the authors' operative material this occurred in 41 of 75 cases, or 54.7 per cent.

2. Sterility of this bile is especially frequent in cases of uncomplicated chronic calculous cholecystitis and atrophic sclerosing cholecystitis, and was observed in from 25 to 34 of such cases, or 73.5 per cent.

3. Stagnation of this bile, resulting from dyscinesia or stenosing inflammation of the sphincter of Oddi, in the absence of stone, resulted in infection of the bile in the common duct in 4 of 7 cases.

4. Stones in the common duct were the most frequent cause of infection of the bile. Infection occurred in 16 of 18 cases with stone in the common duct, or 88.8 per cent.

5. Bacterial infection of the common duct is always associated with infection of the other parts of the biliary system, and the bacteria found are generally of the same species.

6. The bile in the common duct appears to have strong bactericidal power. This finding is striking and of great practical importance.

JOHN J. MALONEY, M.D.

Morton, H. B.: The Treatment of Common-Duct Stone Missed at Operation. *Surgery*, 1942, 12: 591.

Two cases of calculus in the common bile duct are reported in which the stone remained in the duct after operation. In each case the stone was disintegrated by the action of ether and alcohol injected into the T tube. This dissolution of the stone and its passage into the duodenum were demonstrated by cholangiographic studies. J. M. MORA, M.D.

GYNECOLOGY

UTERUS

Torpin, R., Pund, E., and Peeples, W. J.: The Etiological and Pathological Factors in a Series of 1,741 Fibromyomas of the Uterus. *Am. J. Obst.*, 1941, 44: 569.

The incidence of fibromyomas in Negro women residing in the neighborhood of Augusta, Georgia, is three and one-third times that in white women.

Sixty per cent of the white women had tumors smaller than 5 cm. in diameter. Sixty-six per cent of the Negro women had tumors larger than 5 cm. in diameter.

Chronic salpingitis was found in one-sixth of the white and more than one-half of the Negro patients with fibromyoma. On the other hand, 40 per cent of all operations for chronic salpingitis revealed complicating fibromyomas.

Necrosis in general was about twice as frequent in the tumors of the Negro women as in those of the white women.

Fibromyomas were found to be relatively free from malignant complications, but sarcomas were more frequent in the Negro women, while carcinomas were found to be more common in the white women.

Complicating ovarian changes revealed follicular and corpus-luteum cysts to be relatively frequent, cystadenoma to be present in 2 per cent of all fibromyomas, and dermoid cysts in 1 per cent of the white and in 2 per cent of the Negro patients.

EDWARD L. CORNELL, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Kulka, E. W.: True Bone Formation in the Fallopian Tube. *Am. J. Obst.*, 1942, 44: 384.

So far as one can judge from the histological pictures in the 4 cases presented, the bone tissue seems to have formed in 3 different ways. Where the connective tissue of the tubal wall runs parallel to the bone lemellae the process resembles periosteal bone formation. In other places one can follow the connective-tissue bundles into the periosteal tissue and finally into bone. Here there is a direct metaplasia according to Maximow, analogous to intermembranous bone formation. Finally, the osseous bars are formed around and in the midst of the calcium deposits by osteoblast, which arise from the fibroblasts of the young granulation tissue. These young cells have to a great extent the same properties as the primitive reticular cells of the blood-forming tissues. The granulation tissue dissolves and resorbs the mineral deposits and penetrates into the slits thus formed. These cavities become the new bone-marrow cavities, and from here the osteoblasts form the bone tissue on the remnants of the detritus and calcified connective tissue.

In 3 cases a diagnosis of tuberculosis was made, in 3 others a tuberculous origin was assumed. The condition reported here is, of course, mostly of theoretical interest. The only practical point was brought out by Barca and Foged, who found shadows in their roentgenograms which corresponded to the bone formations. EDWARD L. CORNELL, M.D.

EXTERNAL GENITALIA

Whittemore, W. S.: Pregnancy Following Operation for Congenital Absence of the Vagina. *Am. J. Obst.*, 1942, 44: 516.

This is a report of a case of successful childbearing following an operation for the construction of an artificial vagina in a patient who presented the following anomalies:

Agenesia of the vagina, left tube and ovary, left round ligament, left infundibulopelvic and left uterosacral ligaments, together with agenesia of the left kidney and the presence of an abdominal ninth rib on the left side. In this case the Graves' operation for the construction of an artificial vagina was eminently successful, although a modification in the technique has been suggested. The patient is now pregnant for the second time. The first delivery was by cesarean section.

It is very important in the after-care of patients operated upon for vaginal agenesia to stretch the artificial vagina twice weekly for six months. If they are married they should have coitus twice weekly during this time. The tendency to contraction of the artificial vagina, however, is over at the end of six months. EDWARD L. CORNELL, M.D.

MISCELLANEOUS

Greenblatt, R. B., Mortara, F., and Torpin, R.: Sexual Libido in the Female. *Am. J. Obst.*, 1942, 44: 658.

It must be admitted that sentimental, psychological, and anatomical factors greatly influence the libido, but nevertheless the role of the hormones is such that libido may be spoken of as a test-tube chemical equation. Progesterone, the hormone of the corpus luteum, in chemically pure crystallizing state may be administered to depress excessive libido when present; on the other hand, chemically pure androgenic substances when properly administered decidedly increase the well-being of the patients as well as the libido. Although the parenteral and oral administration of compounds of testosterone was frequently followed by increase in sexual urge, it was found that more consistent results could be obtained by pellet implantation. One-hundred-milligram dosage proved ideal. Pellets of testosterone propionate implanted subfascially are capable of providing a continuous prolonged, nearly natural

physiological action. No fear of virilization need be entertained with this method and in dosages up to 400 mgm. In almost every patient who once had known libido, a resurgence followed testosterone propionate pellet implantation.

These facts may provide a working basis for treatment. The psychotic tendencies of the nymphomaniac, the neuroses and unhappiness of the frigid female, and the problems of the incompatible couple with their sociological implications are amenable to hormone therapy. There is much that can be done for the individual whose life may be colored by sexual frustration or sexual excess. The potentialities for correcting such maladjustments and for bettering human relationships may lie in the physician's hands. EDWARD L. CORNELL, M.D.

Smith, G. Van S., Smith, O. W., and Schiller, S.: Clinical Experiments in Relation to the Excretion of the Estrogens. Functional Flowing. Urinary Estrogens Before, During, and After Progesterone, Estriol, and Cyclic Administration of Progesterone and Estradiol Benzoate. *Am. J. Obst.*, 1942, 44: 606.

A patient whose menstrual history since puberty has duplicated every pattern of functional flowing has been studied and treated for eight years. The results herein reported cover the past sixteen months, during which large amounts of progesterone have twice been given to control profuse flow, estriol has been given over a three-month period in the hope of inhibiting ovarian activity, and seven series of progesterone and estradiol benzoate injections have been given cyclically, the last treatment finally accomplishing the desired objective, namely, the establishment of spontaneous and regular ovulatory cycles.

Urinalyses for estrogen metabolites throughout this investigation have confirmed previously reported conclusions concerning estrogen and progestin metabolism in women and have led to the following general conclusions: (1) functional flowing is associated with a progestin deficient metabolism of estrogen, and results from fluctuations in ovarian secretion in the absence of adequate luteal control; (2) progesterone, in large amounts, constitutes a specific therapeutic agent for the production of a more normal estrogen metabolism and the control of functional bleeding; (3) estriol, although well absorbed from the intestinal tract and less rapidly destroyed than estradiol or estrone, is comparatively ineffective, possibly because of its relative stability, in influencing pituitary-ovarian activity; (4) estrogen and progesterone withdrawal results not only in normal endometrial bleeding but in a sudden increase in the rate of estrogen destruction, which may provide a necessary stimulus for the normal growth and maturation of ovarian follicles; (5) if this stimulus is artificially supplied at monthly intervals, a normal pituitary-ovarian cycle may be established which will continue after cessation of the cyclic therapy. EDWARD L. CORNELL, M.D.

Mason, L. W.: Spontaneous Abortion and Its Treatment with Progesterone. *Am. J. Obst.*, 1942, 44: 630.

The following report on the treatment of abortion was based upon a series of 311 consecutive pregnancies, all of which were cared for by the author personally in private practice. Among these 311 pregnancies, there was a total of 19 abortions, or an incidence of about 6 per cent. Six of these abortions were in 2 patients, who had 3 each. Some of these patients aborted without treatment and some represent failures in treatment. These cases are included without differentiation at this point.

There were 34 "threatened" abortions which were treated. These were manifested by painful rhythmical uterine contractions or bleeding, or both. In 30, or 82 per cent, the abortion did not occur and the patients were carried to term. Four patients aborted in spite of treatment. One of these was carried to term in her next pregnancy by prophylactic treatment begun shortly after the first missed menstrual period. The other 3 could not be followed up.

In addition there were 17 patients who were treated prophylactically from the beginning of their pregnancies. These patients gave a history of having had from one to three previous consecutive abortions, and several of these had had long periods of sterility before the first pregnancy, or between abortions. Of these 17 patients, 15 were carried to term the first time such prophylactic treatment was given. All gave birth to entirely normal babies, and all of these babies continued to develop normally thereafter.

In addition to all other measures which should constitute good prenatal care, which have been previously mentioned, the only other agent which was used in the treatment of "threatened" abortion, or in the prophylactic treatment of abortion, was progesterone. In no case was morphine used.

Progesterone was used in 5 mgm. doses (given intramuscularly in oil) in cases of threatened abortion. If the symptoms were slight, being marked only by slight cramping or slight bleeding, or sometimes both, this dose was given once daily. If the symptoms were more severe, 5 mgm. were given twice daily, frequently for several days. As soon as cramps and/or bleeding ceased, the progesterone was not immediately discontinued, but gradually decreased doses were used for a period of about four weeks.

If the patient had had two previous abortions and no successful pregnancy, she was usually given 5 mgm. of progesterone three times a week, and that amount daily through the second and third missed menstrual period times. If possible, 5 mgm. doses were continued three times weekly through the fourth missed period and then reduced to 2 mgm. three times a week. After the fifth month it was given twice a week through the seventh month, when it was usually stopped, although in 3 cases it was continued beyond this time.

EDWARD L. CORNELL, M.D.

Adair, F. L., and Hac, L. R.: Sulfonamide Therapy in Gonococcal Infection in Women and Children. *N. England J. M.*, 1942, 227: 465.

Sulfonamides were used in the treatment of gonococcal infection in 453 ambulatory women and 80 children.

Diagnosis and cure were based on cultures as well as smears. The former were more reliable.

Patients should be observed through two negative menstrual periods before they are discharged as cured. Prolongation of the observation period revealed practically no recurrences in the third month.

Sulfathiazole and sulfadiazine are the drugs of choice for the treatment of women. The rate of cure with sulfanilamide was 76 per cent, with sulfapyridine 86 per cent, with sulfathiazole 93 per cent, and with sulfadiazine 96 per cent. The table of dosages is included. The authors do not believe that higher doses are necessary or desirable.

Women respond rapidly to sulfonamide therapy and become noncontagious much earlier than when local treatment is used. Of those cured with sulfathiazole, 97 per cent had negative smears and cultures within four days after treatment was begun; with sulfadiazine 98 per cent responded within four days. Failures often respond when the drug is switched.

TABLE I.—SULFONAMIDE DOSAGE IN AMBULATORY CASES OF GONOCOCCAL INFECTION IN WOMEN

Drug	Daily Dosage* *gm.*	No. of days	Total No. of days	Total dosage *gm.*
Sulfanilamide	4 (60 gr.) 2.6 (40 gr.)	4 10	14	42 (630 gr.)
Sulfapyridine and sulfathiazole	3 (45 gr.) 2 (30 gr.)	2 4	6	14 (210 gr.)
Sulfadiazine	2 (30 gr.)	6	6	12 (180 gr.)

*Divided into four equal doses.

Secondary complications are rare if sulfonamides are administered early. None of the patients discharged as cured required surgical treatment for complications.

Drug-fast strains of gonococci are produced extremely rarely in women: 1 in 453 patients.

Sulfathiazole is the drug of choice in the treatment of vulvovaginitis in children. The dose should be about 0.75 gm. per 20 lb. of body weight daily, divided in 4 doses. Sulfanilamide is contraindicated.

DANIEL G. MORTON, M.D.

Bibb, J. D.: The Use of Sulfanilamide Powder in Gynecological and Obstetrical Operations. *Am. J. Obst.*, 1942, 44: 464.

All the cases in which sulfanilamide powder was used at operation at the Woman's Hospital during 1941 are reviewed, and only 2 complications due to the use of the drug were noted. One was a severe cyanosis and the other was hepatis which ended in death of the patient, but other factors than the sulfanilamide were operating in this case as only 6 gm. were used. Prevention of abscesses at the upper end of the vagina and prevention of peritonitis are the two clear-cut objectives to be striven for in the use of the powder in complete abdominal and in vaginal hysterectomies. In this short series, progress was made toward both of these.

In cases with infection, prevention of peritonitis is more difficult to evaluate and abscess formation harder to control because of the variability in degree and virulence of infection and amount of spill. Sulfanilamide did not prevent urinary, respiratory, nor circulatory complications, nor did it rescue moribund patients. Its use cannot obviate the need for good judgment and early treatment.

EDWARD L. CORNELL, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Woodhull, R. B.: Traumatic Rupture of the Pregnant Uterus Resulting from an Automobile Accident. *Surgery*, 1942, 12: 615.

The author reviews the literature concerning traumatic rupture of the uterus and presents an extensive bibliography on this subject that should prove useful.

An additional case history is presented of a woman seven months pregnant who was injured in an automobile accident. The diagnosis was not made until one month later. This patient did not exhibit any of the usual signs of rupture of the uterus such as intra-abdominal hemorrhage, shock, abdominal pain, or vaginal bleeding. During this period the patient remained in good condition. The uterine mass was finally found to be separate from the fetus.

A laparotomy was performed. No blood or fluid was found in the peritoneal cavity, the uterus being firmly contracted. The fetus was found in the abdominal cavity and extended through the uterine tear. The pelvic contents and fetus were completely walled off by a fibrous exudate. A supravaginal hysterectomy was done and convalescence was complicated by bronchopneumonia and intestinal obstruction. Recovery was complete.

The author reviews the salient points in making a prompt diagnosis. Treatment should consist of combating shock and laparotomy. Hysterectomy is the treatment of choice in all instances. Exceptions to this should depend upon the desires of the patient, provided she is warned of the possibility of rupture of the uterus with any subsequent pregnancies.

JOSEPH E. FIELDS, M.D.

Karnaky, K. J.: The Use of Stilbestrol for the Treatment of Threatened and Habitual Abortion and Premature Labor. A Preliminary Report. *South. M. J.*, 1942, 35: 838.

Stilbestrol can be used for the treatment of premature labor, and threatened and habitual abortion. Patients with threatened and habitual abortion having severe labor pains and some vaginal bleeding are treated with 25 mgm. of stilbestrol injected into the anterior wall of the cervix, and 5.5 mgm. of stilbestrol tablets every fifteen minutes as long as there are any uterine pains. If the pain returns and is severe, the 5.5 mgm. tablets are given every fifteen minutes until the pain is entirely gone. After the pain is gone, 10 mgm. of stilbestrol in tablet form is taken every hour for 6 doses and then 5 mgm. every hour for 6 doses. Then 10 mgm. is taken every night until the eighth month. The injections may be skipped and only the tablets used if the patient is seen early and the pain and bleeding are mild. It depends entirely upon the case. Too little can be given, but not too much.

In habitual abortion, 10 mgm. are given once or twice a day as soon as pregnancy is diagnosed. The patient takes two 5 mgm. tablets every day for at least seven months.

Uterine pains of threatened, habitual, complete, and incomplete abortion, and normal labor pains can be stopped immediately with the injection of from 25 to 100 to 200 mgm. of stilbestrol in oil into the anterior wall of the cervix. Hard contracted uteri of abortions can be made to soften and assume their normal consistency within from thirty to sixty seconds and to remain so for from six to eight to twenty-four hours or longer.

Stilbestrol apparently works (1) by keeping or raising the blood estrogenic level above the estrogenic labor level; (2) by keeping the sodium, calcium, potassium, magnesium, and phosphorus ions from being concentrated at the level which produces uterine contraction; (3) by keeping the estrogenic-ionic ratio from being optimum for labor, or (4) by stimulating the corpus luteum to produce more progesterone.

It may be that stilbestrol prevents the destruction of progestin. Stilbestrol may cause an increased utilization of the pregnancy gonadotropic factor.

A deficiency of estrogen and progestin apparently results in an abnormal metabolism of both, which involves less complete conversion and utilization and more rapid destruction. Such changes in these compounds occur at normal and premature delivery. Stilbestrol may cause more complete conversion and utilization and less rapid destruction of progesterone and estrogens. Labor has been prolonged by the giving of large doses of stilbestrol, so the increase in estrogens is apparently not the cause of labor.

Stilbestrol may replace the rapidly destroyed natural estrogen and in turn stimulate the placenta directly to produce more progestin and estrogen, or indirectly may cause the placenta to utilize the chorionic gonadotropin to produce both estrogen and progestin.

More than 150 cases of abnormal uterine contractions and pains have been stopped by stilbestrol. This substance, being very economical and nontoxic, as well as non-nauseating in the pregnant woman, may replace corpus luteum altogether for the treatment of threatened and habitual abortions and premature labors.

No deaths in utero have been observed after from 25 to 6,000 mgm. of stilbestrol were administered in 20 cases of normal pregnancy; therefore, stilbestrol in therapeutic doses apparently will cause no harm.

Sixteen normal children have been born to 16 mothers who have had large doses of stilbestrol because of threatened, habitual abortion, or premature labor. About 10 similar cases are still under

observation. Since the original article has been read, 17 more threatened abortions have been prevented and the delivery of all normal babies was accomplished. One hundred and thirty-seven pregnant women are taking stilbestrol at present. No fetal abnormalities have been observed in any of the babies who have been carried to term with stilbestrol.

Stilbestrol will not cause abortion or severe uterine contractions, but it will produce normal rythmic contractions if the uterus is in a state of contraction; and no change in contractions if the uterus is contracting normally, there will be no change in the contractions.

Because of the frequency with which threatened abortion is controlled with bed rest and sedatives, it is not easy to evaluate accurately the value of hormones in these cases. Most of the patients were ambulatory, so it is believed that they would have aborted.

Cramping uterine pains of an abortion can be controlled with stilbestrol. The result is immediate; therefore, estrogen may be the essential hormone.

Sterile patients who become pregnant after study are given 10 mgm. of stilbestrol by mouth every night for seven months. CHARLES BARON, M.D.

Eisele, C. W., Tucker, W. B., Vines, R. W., and Batty, J. L.: The Problem of Unsuspected Tuberculosis in Pregnancy. *Am. J. Obst.*, 1942, 44: 183.

The inadequacy of symptoms and physical examinations as means of discovering pulmonary tuberculosis has been discussed. An error of 90 per cent may be expected when these methods alone are used.

Routine chest fluoroscopy, followed by roentgenograms in all cases with definite or suspected lung pathology, is a satisfactory method of finding tuberculosis when it is carried out by an experienced examiner trained in fluoroscopic technique and lung pathology.

Application of this method to 10,968 pregnant women, unselected except for the exclusion of known tuberculosis, disclosed 110 cases of unsuspected clinically important tuberculosis, or an incidence of 1.0 per cent. Seventy-four cases, or 0.7 per cent, were shown to be active during the pregnancy.

The incidence of unsuspected tuberculosis has remained nearly the same for the two periods of this investigation, namely, 1.06 per cent from 1934 to 1937 and 0.98 per cent from 1937 to 1941.

In contrast to this, the incidence of unsuspected syphilis declined markedly, from 0.87 per cent from 1934 to 1937 to 0.30 per cent from 1937 to 1941. This decline may be attributed to the passage of the Illinois hygienic marriage law in 1937.

Routine chest roentgenological examinations should rank with routine Wassermann tests as a medical necessity in pregnant women. The desirability of premarital laws relating to tuberculosis similar to those relating to syphilis has been discussed.

Tuberculosis in pregnant women is still an important problem, for although it has declined from first to seventh place as a cause of death in the general population, it still remains as the leading cause of death for women of the childbearing age. The tuberculosis toll in this age-sex group accounts for 20 per cent of all deaths, which is twice as high as the mortality from all puerperal causes.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

DeNormandie, R. L.: Five-Year Study of Cesarean Sections in Massachusetts. *N. England J. M.*, 1942, 227: 533.

This splendid report summarizes the findings of the five-year study of cesarean sections in Massachusetts, from 1937 to 1941, sponsored by the Massachusetts Department of Public Health, and the Section of Obstetrics and Gynecology of the Massachusetts Medical Society, the yearly results of which have been published previously.

The total number of births during this period was 333,731, of which 3.3 per cent were by the abdominal route (11,030 cesarean sections and 87 hysterotomies). Of the cesarean sections 45 per cent were emergency and 54.3 per cent elective; 53.4 per cent were lower-segment operations, and 42.6 per cent were classical. In a very small proportion of the cases the operations were of the extraperitoneal or of the Porro types. Roughly, two-thirds of the patients were not in labor at the time of the operation.

The total number of babies lost was 986, or not quite 1 in 10. Almost half of the infant mortality occurred in cases of placenta previa or separated placenta. The author questions the advisability of many of these operations for they were done at six or seven months' gestation and could undoubtedly have been managed satisfactorily by vagina. There was also a considerable fetal mortality following elective sections apparently due to the fact that the time of operation was badly chosen; the babies were premature.

The most common indications in the order of their frequency were (1) previous section (3,267), (2) contracted pelvis and disproportion (2,193), (3) placenta previa and separated placenta (1,503), dystocia (1,041), (4) toxemia (547), and (5) malposition of the baby (479). There were many other indications, of course, of almost every conceivable kind.

Analysis of the individual cases made it obvious that many of the operations were unjustifiable, or that they were performed at improper times. In many of the elective section cases, or those done because of previous section, the babies were premature, which indicated that the operation had been performed too early. Under the indication toxemia, it appeared that the pregnancies had been allowed to continue too long; more careful prenatal care might have made the cesarean section unnecessary. In some of the cases of "dystocia" the patients had had no labor at all. The advisability of sectioning many of the patients with cardiac conditions is questioned for it is known that such patients often

have short easy labors. The author condemns the indications "request of the patient, or for sterilization" (73 cases) and "malformation of the fetus" (19 times).

TABLE 6.—CAUSES OF DEATH IN CESAREAN SECTIONS

Cause of death	No. of cases	Percentage of total
Sepsis	106	38.8
Hemorrhage	32	11.7
Embolus	28	10.0
Shock	25	9.1
Cardiac	17	6.2
Anesthesia	11	4.0
Eclampsia	10	3.6
Acute respiratory infection	8	2.9
Toxemia	7	2.5
Anaphylaxis	6	2.1
Intestinal obstruction	4	1.4
Acute pulmonary edema	4	1.4
Premature separation of placenta	3	1.0
Miscellaneous (1 each, chronic nephritis, toxic purpura hemorrhagica, thyrotoxicosis, superior mesenteric thrombosis, scarlet fever, acute yellow atrophy, anuria, uremia, surgical emergency, carcinoma, no adequate cause and not reported)	12	4.3
Total	273	

The table of death causes is of great interest and is included. There were 273 maternal deaths, or 2.46 per cent, a good figure but one which the author believes can be improved. Cesarean section figured in 20 per cent of the maternal mortality cases occurring in Massachusetts. The author points out that the fact that nearly 40 per cent of the patients died of sepsis is a serious criticism of the medical profession because it shows that there was either error in technique or in the choice of the method of delivery.

The author believes that all medical men who handle obstetrical cases should study reports of this kind very carefully; they are of the utmost value in helping us to lower the maternal and infant mortality.

DANIEL G. MORTON, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Rutherford, R. N.: Changes in the Female Genital Tract during the Puerperium Induced by Sex-Hormone Therapy. *Am. J. Obst.*, 1942, 44: 595.

Three different groups consisting of 12 patients each were studied by endometrial biopsy and vaginal smear during the puerperium. One group consisted of normal post-partum patients, who each supplied a single day's picture. A second group of normal post-partum patients was given 10 mgm. of diethylstilbestrol orally for the first twelve post-partum days, and each patient supplied only one endometrial biopsy and one vaginal smear. A third group of normal post-partum patients was given 10 mgm. of methyl testosterone orally for the first twelve post-partum days, and each patient supplied only one endometrial biopsy and one vaginal smear.

These hormone-treated patients demonstrated definite variations from the normal processes of involution, repair, and regeneration.

Involution was delayed by female sex hormones, but not by male sex hormones. Repair was hastened by female sex hormones, but markedly retarded by male sex hormones. Regeneration was hastened for covering of the surface epithelium by female sex hormones, but stromal regeneration was delayed. Regeneration was delayed by male sex hormones.

The effects of female sex hormones were lost within one week after withdrawal, and the effects of male sex hormones were lost within three weeks after withdrawal of the hormones.

Certain theoretical questions regarding the use of either agent in the puerperium are raised.

EDWARD L. CORNELL, M.D.

NEWBORN

Macpherson, A. I. S.: Observations on the Etiology and Prophylaxis of Prothrombin Deficiency and Hemorrhagic Disease in the Newborn. *J. Obst. Gyn. Brit. Empire*, 1942, 49: 368.

Various conditions of pregnancy such as toxemia, premature labor, dietary deficiency of foods rich in Vitamin K, and prolonged labor are considered by the authors in relation to the degree and duration of hypoprothrombinemia in the newborn. They found that none of these had any constant effect upon the prothrombin time of the newborn except the deficient diet during pregnancy. Such dietary deficiencies showed consistently low prothombin indices in the newborn. Prolonged labor *per se* did not affect the prothombin index of the infants except when complicated by repeated chloroform anesthesia. Under these conditions the prothrombin time was found to be so low that it was believed that prothrombin synthesis in the fetal liver had been depressed by the chloroform.

The feeding of an absolutely K-deficient diet from the time of birth indicated that the conditions of ingestion and absorption of Vitamin K do not affect the fall of prothrombin time but they do influence the subsequent recovery to normal.

Fifteen cases of hemorrhagic disease of the newborn are reported. In 2 of these cases bleeding occurred as a complication of erythroblastosis fetalis. In every case of simple hemorrhagic disease in which the antenatal diet was investigated, there had been a diet markedly deficient in foods high in Vitamin K content. Among these 15 selected cases the most frequent site of bleeding was the gastrointestinal tract. Cerebral hemorrhage occurred in 4 of the 15 cases. Two hemorrhages occurred in very premature babies. The authors believe that it is possible to prevent hemorrhagic disease of the newborn by proper dietary supervision during pregnancy. When this is impossible the deficiency can be made up by administration of Vitamin K to the mother late in pregnancy or during labor.

JOSEPH E. FIELDS, M.D.

Parks, J., and Sweet, L. K.: Does the Antenatal Use of Vitamin K Prevent Hemorrhage in the Newborn Infant? *Am. J. Obst.*, 1942, 44: 432.

The authors made a careful clinical analysis of gross hemorrhage occurring in the infants of mothers who were admitted to a municipal hospital. These mothers represented the lowest income group of a metropolitan area. It is reasonable to assume that dietary deficiencies and obstetrical complications were maximal in this group of patients. If these factors contribute materially to the occurrence of hemorrhage in the newborn, any procedure directed toward the reduction of neonatal hemorrhage should manifest its greatest benefits in patients of the lowest economic level.

A single dose of 5 mgm. of Vitamin K was given by mouth on admission to the mothers of 1,151 infants on admission, and the infants of 1,594 mothers who received no Vitamin K served as controls. There was no appreciable ill effect of the vitamin on the mothers. As it was done in this study, the administration of Vitamin K to mothers had no evident effect in reducing the incidence of neonatal hemorrhage. The Vitamin K used was effective in raising the blood prothrombin levels of both the mothers and infants. If an elevated blood prothrombin level is a significant factor in preventing neonatal hemorrhage, the authors are unable to explain the results of the clinical survey. Additional clinical and laboratory studies of large groups of patients should solve this problem. EDWARD L. CORNELL, M.D.

MISCELLANEOUS

Dickinson, K., and Procter, I. M.: Comparative Measurements of the Female Pelvis. *Am. J. Obst.*, 1942, 44: 585.

First, the anteroposterior diameter obtained by one x-ray technique was checked for accuracy against the same diameter obtained by a second x-ray technique. Second, the anteroposterior diameter of the pelvis obtained with x-rays was checked for accuracy against the same diameter measured at the time of operation. Third, the anteroposterior diameter obtained with x-rays was compared with the diagonal conjugate. Fourth, the anteroposterior diameter measured at the time of operation was compared with the diagonal conjugate.

In 83 per cent of the cases the anteroposterior roentgenogram compared favorably with the lateral one. The anteroposterior diameter was the same in both, allowing an error of 4 mm. This error seems acceptable since in the authors' experience the same observer will not remeasure a diameter closer than that figure. Furthermore, two observers measuring the same diameter will vary as much as 4 mm. in their readings.

It is necessary to emphasize that the roentgenogram is not the answer to an obstetrical problem in itself, nor is it an infallible instrument of precision; it is another means of study which when added to the usual pelvimetry, physical examination, and laboratory studies, assists in obtaining the desired answer. When compared with the diagonal conjugate and the true conjugate, measured at the time of operation, it gives a new insight into the value of the diagonal conjugate. In this series the unmodified diagonal conjugate appeared to be a more accurate measurement in indicating the true conjugate than the one from which 1.5 or 2 cm. has been subtracted.

In the series of 300 women studied, the gynecoid pelvis was the predominating type; mixed forms were the next most frequent. The true "parent type" of pelvis is probably less often seen and the mixed forms more often seen than these statistics would indicate. The authors' qualifications for admission into the latter group may be responsible for this fact. EDWARD L. CORNELL, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Harris, A.: Crossed Renal Ectopia without Fusion. Report of a Fourth Case; Transperitoneal Pyelotomy. *J. Urol.*, Balt., 1942, 48: 252.

The author reports a fourth case of crossed renal ectopia without fusion.

Pyelotomy was successfully performed in an acquired solitary kidney lying low in the presacral position.

In the author's experience transperitoneal approach is the method of choice for pyelotomy or nephrectomy with the kidney in such a low fixed position, especially in view of the very abnormal blood supply.

His 3 previous cases were recorded in 1939. In 2 of these transperitoneal nephrectomy was successfully performed by the same method. In the third case there were no symptoms or associated disease necessitating surgery.

It is worthy of note that the review of the literature in 1939 revealed the previous report of a total of only about 25 cases of crossed ectopia without fusion.

JOHN A. LOEF, M.D.

Simeone, F. A.: Perinephric Abscess. *Arch. Surg.*, 1942, 45: 424.

The author reports that in the past twenty-eight years 66 patients have been treated at the Peter Bent Brigham Hospital in Boston for perinephric abscess, and 6 additional patients presented signs and symptoms comparable to those of perinephric abscess but they were not operated upon and the diagnosis was never confirmed.

The author points out that the term "perinephric abscess" is adequate, provided that it is qualified by the adjective "simple" or "complicated." The former type refers to infection of the perinephrium from a renal abscess or from some distant focus by way of the blood or lymph stream. The term "complicated" has reference to extension from a diffuse pyelonephritis or pyonephrosis, or to direct or lymphatic extension from an adjacent or nearby focus.

The condition was found to be uncommon in children and the majority of the cases occurred between the ages of twenty-five and thirty-five years. The condition was of the simple variety. The complicated perinephric abscess was most common in the fourth and fifth decades. Furthermore, in this series females were affected most often by the complicated type and least often by the simple type. The right side was involved two times more frequently than the left.

The statement that there had been an infection for a period of days or weeks prior to the illness was found common. Anorexia, fatigability, and night sweats were the common early symptoms. Subjective and objective fever was present in a large majority of the cases; however, pain was the most common complaint in both the simple and complicated cases. Nausea and vomiting were more common in the complicated cases, as were urinary-tract complaints, as might well be expected. Further, it is interesting that loss of weight may occur. The author reports the case of a female who lost 66 lb. in a year and 33 lb. during the month before he saw her, another who lost 32 lb. during the preceding six weeks, and a twenty-six-year-old physician who lost 25 lb. during his illness of only four weeks.

These patients appear acutely ill and apprehensive although those with complicated perinephric abscess may appear apathetic with wasting and even present coma. The degree of fever is variable. The morning temperature may be normal, with the afternoon and evening temperatures rising to 102° and 106° F. A spiking temperature is usually limited to the early period of the disease. The pulse rate is usually elevated and the rate is dependent upon the severity of the infection and the debility of the patient.

Costovertebral tenderness is common. Loin tenderness and tenderness in the upper abdomen is often present. Spasm in the flank was most commonly found in cases of simple perinephric abscess. The failure to find spasticity in the complicated variety was considered due to the debility of the patient. Visible loin swelling was common although a palpable mass in the region was less common.

Elevation of the ipsilateral diaphragm was found only in the event that the upper pole of the kidney was the site of the infected perinephrium. It was interesting that in the group of 66 patients, scoliosis was found only 4 times, and these 4 cases were all of the simple type. Furthermore, psoas spasm was demonstrated only twice in this series.

Indistinctness of the ipsilateral psoas roentgen shadow was the most common roentgenographic finding in both types of perinephric infection. Pyelographic examination demonstrated calyceal distortion most frequently along with renal rotation and displacement and it depended on the location and extent of the abscess.

Urinalysis most frequently demonstrated albumin and white blood cells. The hemogram demonstrated a white blood count of 19,500 in kidneys without abscess, while in those with an abscess the average was 14,200. Higher white blood counts were found in patients with complicated perirenal abscesses, and the highest recorded was 84,000. The differential count was characterized by the polymorphonuclear predominance ranging from 85 to 90 per cent. The erythrocyte count was dependent upon the patient's general condition and the duration of the illness; however, erythrocyte sedimentation was markedly elevated.

Bacteriological investigation in simple perinephric abscess demonstrated the most common organism to be the staphylococcus aureus. Other organisms recovered were the staphylococcus albus, beta hemolytic streptococcus, and nonhemolytic streptococcus. In the complicated type of perinephric abscess the bacillus coli was the most common organism recovered.

The treatment must be aimed at the condition at hand, and the author points out the following considerations as demonstrated by the statistical analysis of his series.

1. Surgical intervention is best delayed until localization is present, and surgery is not indicated so long as the patient improves with chemotherapy and supportive treatment.

2. The surgical drainage must be adequate. Because of the relations of the perinephrium to the rib cage and the kidney this may necessitate a secondary wound or revision of the first wound. Acid-cured tubes of gum rubber were found superior to cigaret wicks.

3. "A secondary operation for drainage of the kidney for nephrectomy is far preferable to overzealous exploration at the first operation."

4. Nephrostomy is indicated when there is urinary obstruction.

5. The postoperative course deserves especial care since it is during this period that the patient's progress and eventual recovery may depend on additional surgery which must be affected at the appropriate interval.

In complicated perinephric abscess the operative treatment is more complex and the mortality ranges between 14 and 50 per cent as compared to no mortality in the series of cases of simple perinephric abscess. The morbidity in both types was found high and thus the condition assumes economic importance. ROBERT LICH, JR., M.D.

BLADDER, URETHRA, AND PENIS

Simons, I.: Further Neurological Studies by Means of the Microcystometer and the Sphincterometer. Studies in Bladder Function. *J. Urol.*, Balt., 1942, 48: 331.

Since the beginning of cystometry it seemed probable that there was some connection between the action of the detrusor muscle and its control by the nervous system which might be of clinical value. The bladder and its internal sphincter are controlled entirely by the autonomic nervous system. From the author's studies of the sensation and tonus of the bladder and its sphincters by means of the microcystometer and sphincterometer we believe that certain deductions can be drawn, which throw light on the action of the sacral outflow of the autonomic nervous system.

Micturition is controlled chiefly by the lower autonomic neurone, the center of which is in the conus medullaris. The afferent and efferent paths are the sacral parasympathetic (pelvic) nerves. This center is initiated and voluntarily inhibited from the paracentral lobules. It is also probably represented by a center in the hindbrain and by others in the extrapyramidal system. The sympathetic (thoracicolumbar) system is of lesser importance in vesical control.

Sensory points are of paramount importance in evaluating cystometrical data, and by their aid neurogenic dystonias can usually be differentiated from myogenic dystonias of the bladder. Conus activity is controlled by regulatory impulses by way of the corticospinal tracts. Interference with these tracts usually causes hypertonia neurogenica with resultant urgency and incontinence.

Cystometrically, most cases of urgency and incontinence in neurological disease show hypertonia neurogenica due to parasympathetic overaction. Considerable relief and often cure can be obtained by the use of parasympathetic depressants. In the author's hands trasentin (diphenylacetyldiethylaminoethanol hydrochloride) has proved to be of value. This synthetic drug can be administered in doses of 150 mgm., four times daily. Unlike atropine, it rarely has any effect on the pupils or salivary secretion, nor is it toxic up to 900 mgm. daily. In most of the successful cases the hypertonia was markedly reduced and the capacity of the bladder increased under the influence of the medication.

ARTHUR H. MILBERT, M.D.

Culp, O. S.: The Treatment of Ruptured Bladder and Urethra. An Analysis of 86 Cases of Urinary Extravasation. *J. Urol.*, Balt., 1942, 48: 266.

The author describes the anatomy of the male pelvis relative to urinary extravasation resulting from urethral and vesical injury. It is pointed out in particular that the posterior layer of the triangular ligament is thin and definitely more weak than the anterior layer, which explains the frequency of retroperitoneal extravasation in injuries of the membranous urethra. Furthermore, rupture due to infection of the anterior urethra follows two distinct patterns which depend upon whether or not Buck's fascia is perforated: (1) if Buck's fascia is not perforated the extravasation extends between the fascia and the corpora, and (2) if the fascia of Buck is perforated it extends between Colle's and Buck's fascia similar to the path so often taken after traumatic rupture of the anterior layer of the triangular ligament. These various possibilities are demonstrated by illustrations.

Rupture of the bladder. A group of 33 patients was reviewed in this series. The etiology, mortality rate, and type of operative treatment was discussed and demonstrated statistically.

In a review of this series the author comes to the conclusion that vesical perforation could not be determined, whether extraperitoneal, intraperitoneal, or a combination of the two, by the trauma sustained. Also, it was found that the cystogram was most consistently useful in diagnosing rupture of the urinary bladder. There was no relation

found to exist between the mortality and age of the patients although it appeared that operative treatment within two hours of rupture was essential. It was further emphasized that exploration and drainage of the peritoneal cavity was essential since in this group of 33 patients 9 died because of insufficient drainage and inadequate exploration of the extravasation. The introduction of chemotherapy seemed to improve the results of treatment in those individuals who were seen following the appearance of sulfa therapy.

Rupture of the posterior urethra. The injury of the posterior part of the urethra was occasioned most often by fracture of the pelvis in this series and usually demonstrated a complete division of the urethra at the prostatic apex. The heavier anterior layer most often prevents perineal extravasation. The findings are those of inability to void, inability to catheterize the bladder, and a palpable deformity of the prostatic segment, found by rectal palpation.

The series of cases reported in this group was 10 and it was noted that delay in operation more often resulted in disaster in these cases than in the type previously discussed. In complete division of the posterior urethra it is essential to institute perineal anastomosis of the urethra over an indwelling urethral catheter and adequate drainage of the extravasation, especially in the retroperitoneal tissues.

Rupture of the anterior urethra. A series of 42 patients was studied and it was found that in 69 per cent the extravasation was occasioned by attempted dilatation of a stricture. The diagnosis in this group is obvious; early drainage is essential, and it was noted that all patients in whom drainage was instituted within twenty-four hours recovered. In this group, the therapy should be directed toward urethral repair and vesical drainage. If vesical drainage alone is accomplished, the urethral repair must be effected at a later date and thus hospitalization is markedly prolonged. The gross mortality of this group was found to be 14.3 per cent.

Rupture of the anterior and posterior urethra. Ruptures near the anterior layer of the triangular ligament may cause perforation of this layer and thus institute both anterior and posterior urethral extravasations. The author reports a single case in this group which was fatal because it was not realized that the extravasation had extended through the anterior layer of the triangular ligament. Hence, this possibility is emphasized, and it is stated that, since this type of lesion offers a grave prognosis if not diagnosed some urologists advise suprapubic cystotomy and perivesical exploration in every instance of extravasation due to rupture of the bulbous urethra.

ROBERT LICH, JR., M.D.

Reynolds, C. J.: The Diagnosis and a New Treatment of Traumatic Rupture of the Posterior Urethra. *South. M. J.*, 1942, 35: 825.

The author discusses briefly the pathology of traumatic rupture of the posterior urethra and states that he has seen 29 such cases during the period from 1929 to 1941. Usually, fracture of the bony pelvis is present and the injury is created by the fracture fragments which shear the urethra either completely or partially. Shock is common, and the suprapubic region demonstrates subcutaneous hemorrhage and tenderness. Blood in the urethral meatus is usual and the patient is unable to void. The attempt to void is accompanied by sharp perineal pain, and catheterization is impossible. Furthermore, if the scrotal and perineal area demonstrate extravasation, it may be assumed that the membranous portion of the urethra has been injured.

The author advocates the use of a Foley retention catheter under slight tension for treatment in this condition after the patient's initial shock has been combated. In partial rupture of the urethra, the author attempts to introduce a Foley catheter into the bladder by careful manipulation. If this is successful, the bag is distended and the catheter is left in place. The catheter is strapped to the patient's leg to exert slight pressure, and thus it prevents urine from seeping into the posterior urethra and finding its way into the perivesical tissues. The catheter is maintained in position for a period of three weeks and is changed weekly. Too early removal of the catheter produces a cellulitis, caused by the seepage of urine through the not completely healed urethra.

In complete urethral rupture the catheter will not enter the bladder; it buckles in the macerated area of the prevesical space and a bloody fluid exudes from the catheter. Under these circumstances it is suggested that the patient's bladder be opened immediately under local anesthesia, and if there is any possibility that rupture into the peritoneal cavity may have occurred, this must be sought and repaired. The prevesical space is freed as far as possible of blood clots and macerated tissue, and a catheter is retrograded through the posterior urethra. This catheter is then tied to the tip of a Foley catheter and the Foley catheter is drawn into the bladder. The bag of the catheter is distended and traction is applied to prevent further perivesical hemorrhage. Drainage of the bladder by catheter prevents further extravasation.

The author suggests immediate closure of the bladder in these cases and leaving a drain only in the prevesical space. The care of the catheter as well as the time of exhibition is identical to that described previously for the treatment of incomplete rupture. Following removal of the catheter, a 28 F. sound is passed through the urethra after a period of two weeks, one month, and two months, and, if indicated, further dilatations are undertaken.

Nine of the 29 cases reported were treated by this method. The remainder were treated by various other methods, and the author points out that 4 deaths occurred in the series. Etiologically, all cases were of traumatic origin and all patients were seen within six hours of the injury.

ROBERT LICH, JR., M.D.

GENITAL ORGANS

Ravich, A.: The Relationship of Circumcision to Cancer of the Prostate. *J. Urol.*, Balt., 1942, 48: 298.

The author points out that the general incidence of prostatic malignancy in individuals with prostatic disease is usually stated to be 20 per cent. However, the author has noted in his group of Jewish patients that the incidence was only 1.7 per cent, although in non-Jews during the same period the incidence was 20 per cent. Since the only significant difference between these two groups of patients anatomically is that of early circumcision, its relationship to prostatic malignancy is discussed.

The author considers the possibility of a carcinogenic agent under the foreskin of the noncircumcised individual. This agent, whether a virus, parasite, or other organism, reaches the prostate by way of the urethra. It is further mentioned that the late John Osborne Polak of the Long Island College of Medicine in Brooklyn, New York, noted the infrequency of cervical carcinoma in Jewish patients. This observation was recently substantiated by Frank R. Smith of the Memorial Hospital in New York. Hence, the author considers it conceivable that the carcinogenic agent in this instance is subpreputial in origin and is transmitted to the wives of these uncircumcised males during coitus by direct contact. The article is concluded by the statement that a prophylactic measure for both prostatic and cervical carcinoma would be a more universal practice of male infant circumcision.

ROBERT LICH, JR., M.D.

Low, H. T., and Coakley, H. E.: Androgen Inhibition in the Treatment of Carcinoma of the Prostate. *Rocky Mountain M. J.*, 1942, 39: 687.

One of every 25 men reaching the age of sixty has carcinoma of the prostate. Munger, in 1934, originated the concept of relationship between testicular hormones and carcinoma of the prostate. The theory that the prostatic carcinoma derives its stimulus to grow and metastasize from androgen stimulation is now becoming more generally accepted. There are at present three practical means of diminishing androgen formation: irradiation of the testes, estrogens, and castration.

The literature regarding the first type of androgen inhibition is meager and conclusions must await further reports. It seems obvious that supplementary estrogen therapy will be necessary when extragonadal androgen-producing tissue is present. This method has the advantages that the testes are left, yet continued treatment is not necessary when ectopic sources of androgens do not exist.

Apparently most estrogens exert a measurable androgen-inhibiting effect, but stilbestrol, diethyl stilbestrol, and diethylstilbestrol dipropionate are the most effective. The injected preparations are more effective than those administered orally. These preparations inhibit androgen formation from both gonadal and extragonadal sources. Disappearance of pain from metastatic growths, alleviation of the symptoms of prostatic carcinoma, disappearance or arrest of the metastatic tumors, and diminution or disappearance of residual urine are reported. Undesirable effects have been impotence, gynecomastia, edema, and atrophy of the testes and penis. It is necessary to maintain constant contact with the patient for the remainder of his life.

Castration was widely used early in the present century for its inhibiting action on prostatic growth. It was abandoned as the technique of prostatectomy improved. Most men, regardless of age, are reluctant to submit to genital mutilation. Leaving the epididymis partially overcomes this objection. Castration does not eliminate extragonadal sources of androgen, and supplemental administration of stilbestrol may be necessary. The beneficial results closely approximate those of stilbestrol therapy, and improvement in weight, appetite, mental outlook, and blood findings are noted.

On the bases of 6 observations the authors believe that whenever possible, these prostates should be thoroughly resected. The authors have noted relief of pain from metastases, disappearance of symptoms of prostatism, euphoria, increased appetite with attendant gain in weight, together with recession of the original carcinoma. None of the patients has shown stabilization or regression of the metastases but it is possible that these may occur later.

The authors conclude that androgen inhibition has much to offer in the treatment of carcinoma of the prostate and its metastases.

JOSEPH K. NARAT, M.D.

Millin, T.: Postprostatectomy Obstruction. *Brit. J. Urol.*, 1942, 14: 113.

The author points out that in 2 per cent of prostatectomies postoperative urinary obstruction occurs. The most common single etiological factor seems to be infection. The author reviews statistically a group of 53 such cases; however, he comes to no definite conclusion as to the exact etiology and presents a general discussion of the problem.

The formation of a mucosal shelf which causes obstruction is the most common type of obstruction, but its exact mechanism eludes the author's power of explanation, and he discusses various suggestions as to its origin. The use of blind instruments is condemned in the therapeutic armamentarium to combat this "shelf type" of obstruction of the vesical neck. The author describes his method in detail, which is essentially that of introducing into the bladder by visualization a "female filiform." A "male filiform" is then attached to the first filiform and the filiforms are passed well into the bladder and the panendoscope is withdrawn. The original filiform is attached to dilating bougies and the stricture is thus gradually dilated until the panendoscope can enter the bladder. With this instrument in place and the obstruction visualized, the shelf may be cut with a Collings knife and the remnants excised with a

small resectoscope. The method described is much more satisfactory than that with the suprapubic approach and markedly diminishes the period of hospitalization. The author restricts the use of the suprapubic approach in urinary obstruction following prostatectomy when a large calculus or complete urethral obstruction exists, or, as in 1 instance, when obstruction and infection is maintained by the presence of a large bladder diverticulum.

After the Harris prostatectomy the author noted an obstruction which occurred in the posterior urethra and not at the vesical outlet, as described in instances of the Freyer technique. All cases of this posterior urethral obstruction following the Harris operation responded to urethral dilatation. The author points out that he has seen 8 such cases in his personal experience. For cutting the stricture with a Collings knife the author suggests lateral cuts since they eliminate the danger of rectal perforation.

It was noted that adenomas left behind at the time of operation constitute a frequent cause of vesical obstruction. The author emphasizes the fact that often these residual adenomas are extremely small, but may be so located as to occlude the urethral caliber completely. These nodules are best dealt with by means of the resectoscope and thus normal micturition is easily established.

It is recommended that in the presence of a vesical calculus prior to prostatectomy or evidence of urea-splitting organisms a roentgenogram is warranted three months after operation. Residual urine and infection were found most often to be the cause of calculi and therefore these conditions must be dealt with actively. In the event of sacculations of the bladder, crushed calculi are best removed with a rongeur forceps since stone fragments lost in the bladder pockets act as nuclei for further stone formation.

Recurrent obstruction of the vesical neck within a period of one year suggests the presence of prostatic carcinoma. The choice of treatment is usually between a transurethral prostatic resection and cystotomy. The author reserves the latter for instances in which there is much trigonal involvement with marked frequency and in the event of a rapidly growing malignancy.

Acute inflammatory lesions of the urethra are usually suitably treated by conservative measures, and a stricture of the urethral meatus may follow the postoperative use of an unusually large catheter. An illustrative case is discussed. Two other obstructive conditions mentioned following prostatectomy were papillary carcinoma of the bladder base and papilloma of the prostatic cavity.

The persistence of a patent suprapubic vesical fistula was found to be due to the adherence of the tract to the "back of the pubis" in 3 cases, and to vesical diverticula with their ever-present infection in 3 other instances.

The author illustrates his discussion with a few brief case reports and suggests that the one most important factor in prophylaxis of these obstructive complications following prostatectomy is careful postoperative care with prevention of infection.

ROBERT LICH, JR., M.D.

Harrison, J. H.: The Indications and Limitations of Prostatic Surgery in the Presence of Cardiac Disease. *Am. J. M. Sc.*, 1942, 204: 469.

The author discusses the problem of urological surgery in reference to heart disease. The 25 cases reported are divided into three groups:

Group I. Urinary retention developing during or after an acute cardiac crisis.

Group II. Cardiac disease appearing after acute urinary retention or efforts to relieve it.

Group III. Myocardial insufficiency in the presence of chronic urinary retention.

The author found that in Group I there were 12 patients; in Group II, 4 patients; and in Group III, 9 patients.

For this type of patient low spinal anesthesia was found suitable in the apprehensive individual. For suprapubic cystotomy 1 per cent procaine without adrenalin is recommended, and as a general anesthetic ethyl ether with a short vinyl ether induction is suitable. The fact that cardiac patients are not a serious risk when properly handled, has been demonstrated by the work of Butler, Feeney, and Levine who found heart disease in 62 of 500 consecutive patients in whom prostatectomy was done, and 66 operations were performed with 3 "unexpected" deaths.

The individuals of Group I are those with severe angina pectoris, coronary thrombosis, and acute cardiac decompensation. Because of the cardiac condition bed rest is imperative and during this period pelvic congestion, prostatic hemorrhage, or excessive use of drugs may induce acute urinary retention. It is specifically pointed out that an accurate differentiation must be made between urinary retention and oliguria. The author depicts this group with 3 cases. He notes that prostatectomy may not be necessary since after the cardiac upset normal micturition may ensue. However, patients with repeated cardiac failure suffer more severe urinary retention successively.

In the evaluation of Group II for prostatic surgery "the ability of the heart to respond to effort" is a factor of great importance. The second consideration is the liability of the heart to "accidents" such as: acute coronary thrombosis, embolism, Adams-Stokes attacks, paroxysmal tachycardia, auricular fibrillation, bacterial endocarditis, and ventricular fibrillation. The use of vesical drainage for prolonged periods in this group is essential. Generally speaking, at least four weeks of preoperative preparation is consistent with a more favorable prognosis, although each patient constitutes a specific problem.

Cases in Group III of chronic urinary retention coupled with cardiac insufficiency depend prognostically upon the potential renal reserve. In this group preoperative vesical drainage is most pro-

longed and absolutely essential. It is noted here that cardiacs who have nephritis, congestive heart failure, or coronary artery disease do not withstand surgery very well. Furthermore, the preoperative drainage, when prolonged, need not be done in the hospital, and to wait too long is definitely more desirable than to operate too soon. In this group prostatectomy is often followed by definite cardiac improvement.

The 25 cases discussed by the author are carefully analyzed and the following points are of particular interest: (1) the elderly patient with a low pressure for his age presents a definitely poor outlook as compared to the individual with an arterial pressure more in keeping with his age; (2) digitalis is indicated in myocardial insufficiency and if there is any doubt about cardiac efficiency; and (3) the phenolsulphonphthalein excretion may not be indicative of the amount of renal improvement, and thus this point is best determined clinically in conjunction with various laboratory tests. ROBERT LICH, JR., M.D.

Wesselhoeft, C., and Vose, S. N.: The Surgical Treatment of Severe Orchitis in Mumps. *N. England J. M.*, 1942, 227: 277.

The rationale of incising the tunica albuginea in severe orchitis is somewhat comparable to that of paracentesis of a bulging, painful drumhead in otitis media. The operation must be done sufficiently early to avoid pressure necrosis in the testicle. It is useless to operate when the process is already on the wane. Early operation relieves pain, reduces the fever, and avoids atrophy. It is not indicated in mild cases or those in which an epididymitis predominates. An enlarged, hard, tender testicle, with chills and fever, constitutes the indication for surgical interference. Nitrous oxide and oxygen is the anesthetic of choice. A rise in temperature after operation is indicative of an invasion of the virus in some other organ.

The end-results of 9 hospital cases and 1 operated on elsewhere are presented. Moderate atrophy took place in the case operated on too late. In the others there was immediate relief, and no atrophy was apparent at follow-up examinations. Fourteen cases of mild orchitis were observed during this period. The patients were not operated on. A follow-up examination on 10 of these revealed no atrophy. The expected incidence of atrophy after mumps orchitis without surgical interference is 54.7 per cent. Experience suggests that atrophy occurs only after severe cases, and that by an early operation in such cases atrophy can be prevented.

JOHN A. LOEF, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Alldredge, R. H.: Localized Fibrocystic Disease of Bone. Results of Treatment in 152 Cases. *J. Bone Surg.*, 1942, 24: 795.

The purpose of this article is to present very briefly a summary of the end-results of the different methods of treatment used in this group of cases. No excellent results were obtained in the group which had no treatment except for fracture when a fracture was present. In some of these patients the condition improved considerably following fracture, but either deformity or a residual cavity was present as the end-result in every case. No lesion in this group healed spontaneously with an excellent result.

In some of the patients treated by irradiation alone the condition showed definite improvement. Pain was relieved in almost all of them when pain was present. Some patients were able to continue through life without any further treatment after the use of irradiation. In others very little, if any, benefit was obtained. In a fairly large group of cases treated by irradiation, some form of surgery was resorted to later because of unsatisfactory results. There is definite evidence that surgery is less satisfactory when performed after irradiation has failed than it is when employed alone. There is no evidence that preoperative or postoperative irradiation is of any benefit. Arrest of epiphyseal growth was fairly common in this group, and a malignant change took place in the bone in 2 cases many years after irradiation had been used. These 2 instances of malignant change were the only ones noted in this series.

Resection without replacement in unessential bones certainly seems to be the method of choice; this is true especially in the upper shaft of the fibula, and in the ribs. Resection and replacement with a massive bone graft, even in the essential weight-bearing bones, gave excellent results in a very small group of cases. This method of treatment may be more widely used in selected cases as surgical technique improves.

The results from simple curettage alone seem to be just as good as the results from curettage and chemical cauterization of the cavity. If cauterization is to be used, it would seem that thermal cauterization would be preferable because it can be more exactly controlled, and would not affect transplanted bone in the cavity.

In comparing the two groups of cases treated by curettage and the use of bone chips in the cavity on the one hand, and curettage with the use of a massive graft in the cavity on the other, there seems to be little choice between the two methods. The use of the massive graft in this group of cases, however, gave slightly better results than the use of multiple small chip grafts in the cavity. The combined use of the massive graft and multiple chip grafts in the cavity was not used in any case. It is possible that this method might yield better results than either of the others. There can be no doubt that better results were obtained when transplanted bone was used in the cavity than when no bone was transplanted into the cavity.

The results of this study seem to narrow the choice of treatment in operable cases down to two methods: resection, or the use of transplanted bone after thorough cleaning out of the cavity. Irradiation should be reserved for use in inoperable cases, and should then be used only under the strictest precautions, as definite harm may result from its use.

Since most of the cases are seen in childhood, and almost all of them are operable, it is clear that no one method of treatment could be classed as the best method to use in every case. It has been shown that poor results may follow the use of any method that has been used up to this time, except resection. In the nonessential bones, such as the shaft of the fibula and the ribs, resection is the method of choice routinely. In growing children when the lesions are near the epiphyseal line, especially in the essential weightbearing bones, resection is not adaptable. In these cases, thorough unroofing of the cavity, curettage, and the use of transplanted bone would seem to be the method of choice. In cases of long standing in which the lesion has grown away from the epiphysis, resection and replacement by a massive bone transplant should probably be used more often. ROBERT P. MONTGOMERY, M.D.

Hines, H. M.: Effects of Immobilization and Activity on Neuromuscular Regeneration. *J. Am. M. Ass.*, 1942, 120: 515.

The extent and rate of neuromuscular atrophy and regeneration was studied in a series of experiments on the gastrocnemius muscles of white rats following complete paralysis of this muscle by crushing of the tibial nerve or partial paralysis by section of one or more of the spinal nerves contributing motor fibers to it.

The effects of various conditions were then studied, such as immobilization of the limb in a cast, forced exercise, electrical stimulation of the paralyzed muscle, application of cold and heat, and attempts to enhance functional re-innervation through facilitation of axon bifurcation. The results were checked by quantitative measurements of muscle mass, strength and creatine content, the unoperated leg being used as a control.

The results indicated that immobilization in a cast retarded recovery from paralysis, probably because of retarded muscle regeneration rather than because of any effect of the immobilization on nerve regeneration. Neuromuscular regeneration was not retarded by activity and electrical stimulation, even

when carried to the extent of overstretching and muscle fatigue. Both natural and artificial muscle activity caused an improvement in the rate and extent of recovery from peripheral nerve paralysis. The evidence indicated that axon branching could not be utilized to enhance re-innervation of partially paralyzed muscle. CHESTER C. GUY, M.D.

Hefke, H. W., and Turner, V. C.: The Obturator Sign as the Earliest Roentgenographic Sign in the Diagnosis of Septic Arthritis and Tuberculosis of the Hip. *J. Bone Surg.*, 1942, 24: 857.

This article again points out the fact that in certain affections of the hip, and particularly in septic arthritis and tuberculosis, the obturator shadow on anteroposterior roentgenographic examination of the pelvis is wider and more pronounced on the affected than on the normal side.

The authors have shown that this shadow is caused by swelling of the obturator muscle and its coverings. When this sign is noticed in a true anteroposterior view of the pelvis it is indicative of hip pathology. At times, particularly in tuberculosis of the hip, the obturator shadow is obscured. In either case, whether the obturator shadow is obscured or whether it becomes widened with a more curved border, the sign is considered positive.

The authors failed to find a positive obturator sign in Perthes' disease, epiphysiolysis, rheumatic fever with clinical involvement of the hip, fracture about the hip, osteomyelitis of the pelvis not involving or situated adjacent to the hip, and soft-tissue infection about the thigh with marked inguinal lymphadenopathy. ROBERT T. MCELVENNY, M.D.

Gill, G. G., and Abbott, L. C.: Practical Method of Predicting the Growth of the Femur and Tibia in the Child. *Arch. Surg.*, 1942, 45: 286.

A practical method is presented for estimating the final height and the proportionate lengths of the femur and the tibia in individual children. This method can be effectively employed in planning operative procedures which aim to equalize the length of the extremities. By use of the skeletal maturation age, errors are eliminated which might occur if the chronological age alone is employed.

When comparative rates of growth of the extremities are indeterminable by this method, the authors have found the metal markers previously described and placed in the bone by a special technique to be of great value.

The author's method of determining the expected growth of the normal femur and tibia is as follows:

1. The child's height is measured as it stands on the normal leg with the pelvis level.

2. The age is recorded in years and months. This is checked against the skeletal maturation age obtained from Todd's Atlas of Skeletal Maturation (Hand). If the skeletal maturation is more than six months advanced or retarded from the chronological age, the skeletal age should be substituted for the chronological age in all further calculations.

3. From the sex, the height, and the corrected age, the person is placed in his or her percentile position of the percentile chart. By following up the chart between the parallel percentile curves to the completion of growth, the expected final stature of the person is obtained. In boys, growth is complete at the age of eighteen and one-half years; in girls, at the age of sixteen and one-half.

4. The lengths of the femur and the tibia are measured from teleroentgenograms or slit scanograms.

5. The present percentage of the normal femur to the stature is obtained by dividing its length by the present height and multiplying by 100. The same calculation is carried out for the tibia.

6. To the present percentages of the normal femur and tibia to stature, as calculated under 5, are added the amounts, either positive or negative, according to the sex, the corrected age, and the bone. This gives the estimated adult percentages of these bones to stature.

7. These percentages are then multiplied by the predicted stature to give the expected final length.

8. By subtracting the present length of the normal femur from the expected final length of the normal femur, the expected growth of this bone is obtained. The expected growth of the normal tibia is obtained in the same manner.

9. Growth from the distal part of the femur equals the expected femoral growth $\times 70$ per cent; growth from the proximal part of the tibia equals the expected tibial growth $\times 55$ per cent; growth from the distal part of the tibia equals the expected tibial growth $\times 45$ per cent.

The following example will serve to clarify the various steps in predicting the growth of the normal femur and tibia. Suppose the patient to be a girl.

1. Height—53 in. (160.02 cm.)
2. Age—nine years; bone maturation age—ten years.
3. The expected total stature—64 in. (162.56 cm.)
4. Length of femur—14.8 in. (35.56 cm.); length of tibia —12.5 in. (31.75 cm.)
5. Femoral percentage of stature—$\frac{14.8 \text{ in.}}{53 \text{ in.}} \times 100 = 28$ per cent
   Tibial percentage of stature—$\frac{12.5 \text{ in.}}{53 \text{ in.}} \times 100 = 23.5$ per cent
6. Femoral percentage of adult stature—$28 + 0.5 = 28.5$ per cent
   Tibial percentage of adult stature—$23.5 + (-1.0) =$ 22.5 per cent
7. Final length of femur—28.5 per cent $\times 64 = 18.2$ in. (46.23 cm.)
   Final length of tibia—22.5 per cent $\times 64 = 14.4$ in. (36.58 cm.)
8. Expected growth of femur — $18.2 - 14.8 = 3.4$ in. (8.64 cm.)
   Expected growth of tibia — $14.4 - 12.5 = 1.9$ in. (4.83 cm.)
9. Growth distal femur—3.4×70 per cent $= 2.4$ in. (6.1 cm.)
   Growth proximal tibia—1.9×55 per cent $= 1.05$ in. (2.67 cm.)
   Growth distal tibia—1.9×45 per cent $= 0.85$ in. (2.16 cm.)

The average error in the prediction of total stature was 1 in. (2.5 cm.), and in 90 per cent of the cases, the average error was under 2 in. (5.08 cm.). As the tibia and the femur each compose only about one-fourth of the total stature, the error in the prediction of the length of these two bones would be one-fourth of this amount.

A fairly accurate prognostication of final height can be made in the individual child by using the percentile chart. It can be made more accurate by determination of the degree of skeletal maturation and by substitution of the bone maturation age for the chronological age.

An accurate estimate of the probable final stature of any child is of value to the orthopedic surgeon in planning operative treatment in cases of inequality of leg length. For instance, shortening of the leg or epiphyseal arrest might be unwise in a child who is destined to be extremely short at the completion of growth. On the other hand, in a child who is likely to be extremely tall, shortening procedures would be preferable to lengthening ones because of the comparative simplicity of the shortening procedure.

In view of data, it may be concluded that a child maintains the relative proportions of the femur and the tibia to stature with only small age variations. For this reason, the surgeon can estimate the probable adult proportions of these bones to stature by taking a child's present proportions and adding small age changes.

The original article contains a table of additions to the present percentage of the femur and the tibia to the stature. These figures are to be added to the calculated present percentages of these bones to stature according to the age and the sex in order to determine the probable adult percentage of the length of the femur and the tibia to the stature in a child. By the use of this table, the final proportions of the femur and the tibia to the stature will probably be predicted with an error of less than 0.5 per cent in the prediction of the final length of either the femur or tibia.

The authors discuss the estimation of the expected growth of the abnormal limb under the following headings: (1) disturbances confined to specific epiphyseal plates; (2) disturbances affecting the rate of growth of all the epiphyses of the limb; and (3) mechanical loss in length.

In the author's opinion, the operation of leg shortening should be reserved for use in cases in which growth has been completed. The operation of leg shortening has been performed with many types of osteotomy and has been performed in the upper, middle, and lower thirds of the femur. There has been success with the use of all three sites, but union has taken place with greater rapidity when the osteotomy has been performed through cancellous bone at either the upper or the lower third. The least disturbance to the function of the quadriceps muscle group and to the knee joint occurs when osteotomy is done through the upper third. A special type of osteotomy, together with a description of the anatomical approach which the authors have used in this region, will be discussed in a later article.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Dickson, J. A.: Orthopedic Surgery between 2 Wars. *J. Am. M. Ass.*, 1942, 120: 413.

Sir Robert Jones and his associates were the only known orthopedic surgeons in England before the last war. Despite great surgical achievements orthopedists were not looked upon with due respect by other members of the medical profession. With the outbreak of the first world war Robert Jones was intrusted with the establishment of the first military orthopedic service. By the time of the armistice a group of 569 officers of the A.E.F. had worked in closest co-operation with Sir Robert Jones and his British group. Although the Orthopedic Association and the Orthopedic Section of the American Medical Association were in existence before the war this stimulus was of great importance and significance. Standardization of procedures and equipment, and the study of shock, anesthesia, fatigue, exhaustion and neuroses, as well as the opportunity of observing large numbers of patients brought home surgical experience which resulted in physical comfort to patients everywhere.

Daily dressing of wounds prevents rest and counteracts all inventions designated to prevent motion. The Carrel-Dakin method, consisting of constant irrigation of the wound surface by solutions that might inhibit germ growth, was thought to be the answer to all controversial problems. The results were disappointing.

The treatment devised by Orr emphasizes the necessity of immobilization and asepsis rather than antisepsis. Orr's treatment of compound fractures was used in Spain and later in Britain. The primary essentials are immediate reduction of the fracture and adequate immobilization of all parts in correct position. Débridement and alignment of fracture may be carried out with the part in correct position and at rest. Thorough drainage is established and the wound is packed with petrolatum. Sealing off of the wound and permanent immobilization is done to carry the patient through to recovery. Only if immobilization becomes inadequate or the odor unendurable are dressings changed and then in the operating room. Trueta used this method in combination with skeletal fixation in 1,073 cases of gunshot fractures and reported only six deaths. The impressive feature of the Roger-Anderson fixation and the closed plaster method was the comfort of the patient. In the problem of internal fixation Venable and Stuck have made a great contribution in their studies of metals inert to tissue fluids (vitallium, an alloy of cobalt, chromium and molybdenum).

The importance of the sulfonamide preparations in combating infections has been demonstrated both

by oral and local administration. Caldwell emphasized the importance of early implantation of the drugs in the control of infection. A more rapid progress and shorter convalescence in the treatment of compound fractures and other orthopedic conditions were made possible by aiding the natural process and repair and healing with transfusions, vitamins, and nutritional factors.

The hazards of surgery have been diminished by the control of shock with stored plasma and transfusions of whole blood. Advances in roentgenology contributed a great deal to the accurate visualization of fractures and better alignment of fragments. Physical therapy has undergone much refinement and helps in the restoration and preservation of function.

New methods have been devised since the last war and only a few are cited here: the stabilization of the paralytic foot by Dunn in England and Hoke in this country; the extra-articular grafting in tuberculosis of the joints as devised by Hibbs; the use of sunlight in the treatment of tuberculous patients by Rollier; the use of new apparatus for the internal fixation of fractures, designed by Sherman, Murray, and Smith Petersen; arthroplasty operation of the knees and elbows which have been greatly improved by Campbell; the use of vitallium cups in arthroplasty of the hip devised by Smith Petersen. Bunnell has made an outstanding contribution to the treatment of tendon injuries by means of removable wire sutures.

In conclusion the author points out that many controversies as to the merits of some techniques or inventions give more attention to details than to the underlying fundamental principles.

GEORGE I. REISS, M.D.

FRACTURES AND DISLOCATIONS

Blount, W. P., Schaefer, A. A., and Johnson, J. H.: Fractures of the Forearm in Children. *J. Am. M. Ass.*, 1942, 120: 111.

Forearm fractures in children must not be considered along with fractures in adults under anatomical classifications which take no account of the growth factor. Colles' fracture is by far the most common forearm fracture in the adult. In children, the commonest fracture is one of both bones at a higher level, 1 or 2 in. above the wrist joint. Greenstick fractures are common in children and rare in adults. Fracture of the radial head in the adult is frequently comminuted with involvement of the articular portion. In the child there is usually a fracture through the neck with more or less displacement of the entire unbroken radial head. In the adult it is generally wise to excise the fractured head when there is displacement of the fragments. In children, displaced fractures usually require open reduction, but the head should never be resected, always replaced. Eventual complete recovery may be expected in the child. Some residual disability may be expected in the adult.

The authors state that with the exception of fractures of the radial head, which frequently require open reduction, they have found almost no fractures of the forearm which cannot be treated better by closed methods than by open.

In fractures of the upper third of the forearm, the fracture should be reduced and reduction maintained with the distal portion of the forearm supinated in an attempt to align the distal fragments to the proximal. Fractures of the upper third of the forearm comprise 6.9 per cent of the forearm fractures in this series.

Fractures of the middle third of the forearm comprise 17.7 per cent of the forearm fractures in this series, usually involving both bones although a single bone is more commonly fractured in children than in adults. The radius was involved in 91 cases and the ulna in 17. Open operation was used occasionally in the earlier cases but it is difficult to justify it in the light of the authors' experience. In the middle third, alignment is most important, apposition less so. "Bayonet" apposition is satisfactory. Shortening is not desirable but is not of permanent consequence. If there is over-riding of the bones, a simple cast or splint is not satisfactory for preservation of the length and alignment. The authors recommend a traction with a banjo splint incorporated in the cast as the ideal treatment if reduction cannot be accomplished. They therefore urge that a conservative course be followed unless there is an ideal opportunity for open reduction.

An isolated fracture of the ulna with dislocation of the radial head occurred only three times in the series (Monteggia's fracture).

There is definite objection to open reduction of the fractures of the lower third of the forearm. A number of cases have been reported with delayed union, non-union, or infection. The authors suggest simple traction in a cast which is loose enough to avoid ischemia, and even for badly displaced fractures of the lower end of both bones which will result in good function.

Epiphyseal fractures at the distal end of the radius usually cause no difficulties. Closed reduction usually is easy. Slight angulation with only as much as 50 per cent apposition may be considered satisfactory. The results are better following prompt reduction. Growth disturbances are more frequent with open operation than with closed. In this series there were 16 cases, some of which were not completely reduced. There was no case of growth disturbance of more than 3 mm. except for one of 5 mm. of overgrowth. RICHARD J. BENNETT, JR., M.D.

Eck, D. B.: Rupture of the Intervertebral Disc. *Am. J. Surg.*, 1942, 58: 3.

The author's report is based upon a review of the literature and 250 consecutive surgically treated cases.

In considering the etiological factors of protrusion or herniation of the nucleus pulposus it must be considered that the annulus fibrosis is thinner and weaker posteriorly, that the nucleus pulposus expands con-

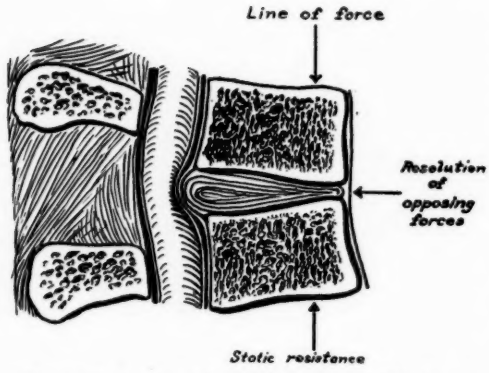

Fig. 1. Illustration of the mechanism responsible for rupture of the intervertebral disc. The compression force from above includes the superincumbent weight plus the added strain of the weight lifted. The static resistance is the stabilizing force which opposes the force from above. These vertical forces resolve themselves in the horizontal force directed posteriorly which, in the presence of the predisposing and precipitating factors, accounts for the rupture. (Courtesy of American Journal of Surgery.)

centrically at the expense of the annulus fibrosis, that the anatomical weakness in the annulus fibrosis exists as a theoretical loss of blood supply or dehydration, and when these predisposing factors exist, trauma is the precipitating factor. Calcification of the intervertebral disc follows rather than precedes rupture.

The predisposing factor, anatomical weakness, may exist in many individuals but rupture may never take place. When the predisposing factor is present, trauma is the precipitating factor. Trauma may be relatively mild or it may be violent and severe; most often, it is sudden. The most common causes of severe trauma are falls from a height and involvement in automobile accidents in which there may or may not be accompanying compression fractures of the vertebrae. Included among the milder forms of trauma are the lifting of weights, the manipulation of the spine under anesthesia, and sudden jerky movements, as in the cervical region. While trauma is ordinarily sudden, it is not to be overlooked that repeated minimal traumatic shocks have a place in the causation of these cases. In the author's series, the lifting of moderately heavy weights and sudden movements of the head figured most prominently in the patient's history.

Rupture of the intervertebral disc occurs with the spine in a position of flexion. Flexion narrows the intervertebral space anteriorly and widens the space posteriorly. The anterior portions of the bodies more closely approximate each other, whereas the spinous processes and posterior portions of the bodies become separated. Upon the occasion of trauma, as in the lifting of a heavy weight, the compression force tending to displace the disc posteriorly becomes excessive and protrusion or herniation results. Since the fulcrum of motion of the vertebral bodies is close to the anterior vertebral margin in flexion, a small compression force anteriorly produces a proportionately greater force posteriorly as the result of its superior advantage in leverage.

In the case of protrusion, the posterior portion of the disc is so compressed against the weakened annulus fibrosus as to cause bulging without actual rupture. When the bulging is sufficient, encroachment upon the cord and/or nerve roots results.

In the case of herniation, the weakened annulus fibrosus ruptures instead of ballooning out while maintaining its stretched weakened fibers intact. Rupture occurs most commonly in the regions of greatest lordosis in the cervical, thoracic, and lumbar segments of the spine posterolaterally. Compression may be bilateral cord, unilateral cord, nerve root or partial cord, and unilateral root. Subjective symptoms and objective findings vary with the site of involvement. The signs and symptoms are discussed.

The author believes that a normal or diminished protein does not exclude rupture, but that a positive increase aids in substantiating and verifying the diagnosis. The chief use of roentgenological examination is in a negative way. It is of little positive value in localizing the site of protrusion or herniation. Myelography has its greatest value in cases in which two or more discs are suspected.

The author believes cognizant omission of myelography to be justified because: (1) the diagnosis in most instances may be made with an accurate history, adequate clinical observation, and laboratory routine in "borderline" cases; (2) we explore the space above the suspected level at operation, as well as the one below; (3) we believe lipiodol is irritating and we fear possible reactions; (4) in the cervical and thoracic regions the lesions are smaller and less likely to be demonstrated; (5) there is difficulty in filling the cervical and thoracic canals with contrast media; and (6) the lesions may be so far lateralward that they do not contact the dura and will not show.

Since Semmes' advocacy of departure from the irritating lipiodol method in 1939, we have made the operative indication on the basis of history and the clinical and laboratory findings, exclusive of myelography with confirmation at operation. The success of this emphasizes the conservatism from both the human and economic viewpoints.

In the presence of reasonably positive diagnosis and persistence of symptoms despite conservative measures (traction, immobilization, physical therapy, the treatment is clearly operative. Simple decompression by release of the scarred, fibrotic ligamentum flavum will suffice in rare instances. The operative treatment of choice, however, is extradural removal through the interlaminar space without cost to any osseous structure, or partial hemilaminectomy by removal of just sufficient of the inferior portion of the lamina above, and of the superior portion of the lamina below, to provide adequate exposure. Though laminectomy is rarely necessary, it may be

indicated in certain instances as in the cases here reported, and in addition it may be necessary to remove some of the articular facets. Spinal fusion is not required when little bone has been sacrificed. In some instances in which the lumbar spine is relatively weak, or the fifth interspace is narrowed, anomalous, or shows evidence of arthritis predisposed to be painful; or in the presence of prespondylolisthesis, Speed believes that fusion should be done. When there is postoperative pain which is relieved by a brace, it is indicated as a stabilizing factor. Many patients with laminectomy of several vertebrae do well without fusion or support. Why others complain of pain, which is relieved by fusion, is still not adequately answered.

Two cases of rupture in the thoracic region are presented and an additional test for detection of rupture at the lumbosacral articulation is advocated.

ROBERT P. MONTGOMERY, M.D.

Colonna, P. C.: An Arthroplasty for Congenital Dislocation of the Hip. A Late Follow-Up Report. *J. Bone Surg.*, 1942, 24: 812.

This is a report on late follow-up studies of 6 cases of congenital dislocation of the hip on which a particular type of arthroplasty had been done. In 2 of these cases, the follow-up period was over nine years, in 2 over seven years, in 1, six and one-half years, and in 1, five years.

Colonna advocates the operation in two types of patients: (1) those under three years of age whose hips have been satisfactorily reduced by closed manipulation but have not remained reduced, and (2) those with dislocated hips who are over three but under ten years of age.

The author has employed this operation on children about twelve years of age but their hips have undergone aseptic necrosis of the femoral head. In none of the 6 cases herein reported has this unfortunate sequela developed. These 6 patients now walk with hardly a limp and present an excellent range of motion in all directions.

The operation is divided into two parts. One consists of preliminary traction to the hip and tenotomy of the adductors. The other is an operative approach to the hip in which the great trochanter with its attached muscles is chiseled through and the capsule of the hip is separated from its surrounding structures. The isthmus of the capule is cut through, the head is inspected, and the capsule is then sewed over the head with chromic suture. A spacious acetabulum is formed as near its original site as the preliminary traction has made possible. No skid or unusual force should be used, nor is it ever necessary if the period of traction has been adequate, to place the capsule-covered head into its new acetabulum. The trochanter is replaced, the wound is closed, and a long plaster spica is applied with the limb in about 20 degrees of abduction and complete extension.

The author stresses the following points:

1. The preliminary traction is obtained by the application of moleskin adhesive plaster to the affected limb followed by stretching of the hip and tenotomy under general anesthesia. A plaster spica is applied to the well leg and traction is put on the affected leg with gradually increasing traction until the head is approximately opposite the old acetabulum. This may take a few weeks. Roentgen-ray check determines this. The second stage should not be undertaken until this end is obtained.

2. The convalescent care is very important. The original spica is worn for four weeks after operation. Then a posterior shell is prepared and the patient is placed in this and active and passive movement at the hip is begun. Care is taken to keep the limb in slight abduction. If adductor spasm is noted no attempt at motion is carried out until traction and rest have overcome this spasm. There is firm union between the capsule and the acetabulum. No weight-bearing is allowed for at least three months after the second-stage operation.

The article contains excellent illustrations of the operation, the end-results as shown by roentgenograms, and detailed case histories.

ROBERT T. MCELVENNY, M.D.

Lewis, K. M., Breidenbach, L., and Stader, O.: The Stader Reduction Splint. *Ann. Surg.*, 1942, 116: 623.

Since 1937, a total of 20 patients have been treated with the Stader reduction splint. The results have been uniformly good, except in 3 patients in whom infection around one or more of the pins occurred. In these cases the infection promptly subsided when the pins were removed. No osteomyelitis was observed, except in a case in which a femur was treated, although in some patients the apparatus has been in position for from fourteen to sixteen weeks. It has been the custom of the authors to keep the splint on until bony union occurred, and this period has varied from eight to sixteen weeks. Most of the cases have been fractures of the shafts of both bones of the leg. One fracture of the shaft of the femur was treated in an old man of eighty-four. This man unfortunately succumbed; however, because of his age he should not have been selected for a trial of the method.

A new splint for reducing and immobilizing fractures of the shafts of the long bones is presented. Early transportation of the patient is possible, in contrast to the impossibility of early transportation when traction suspension is used. This is of importance in bombed areas, either in civil or military surgery. The splint is simple to apply, and correction of malposition of the fragments is possible in all three planes of space even up to the time that fibrous union has occurred. Early weight-bearing and continued use of the contiguous joints is permitted and urged, and this prevents muscle atrophy and stiffening of the joints. After-treatment is reduced to a minimum as muscle strength is retained and joint function is carried on. Seepage around the pins is usually due to galvanism and not to infection. It is not an indication for removal of the pins unless ac-

companying signs of inflammation are present. Seepage has been largely overcome since the pin bar has been made of plastic material instead of metal.

ROBERT P. MONTGOMERY, M.D.

ORTHOPEDICS IN GENERAL

Smith, J. R., and Kountz, W. B.: Deformities of the Thoracic Spine as a Cause of Anginose Pain. *Ann. Int. M.*, 1942, 17: 604.

Case reports are presented of 4 of 15 patients who had anginose pain attributable to spinal deformity. It is of interest that some of these patients experienced unexplained transient relief from the use of nitrites. The seizures of pain could frequently be induced by movements involving the deranged spinal segments. Improvement or cure of the symptoms was obtained by procedures applied in an effort to improve posture.

The mechanism of the production of dorsal-root irritation was studied in the light of clinical findings, and in order to investigate the problem further, an experimental study was made by using a cadaver, with spinal cord and nerves exposed, in which an abnormal degree of spinal flexion and extension could be produced. When the spine was either flexed or straightened to an abnormal degree the spinal canal tended to become elongated so that the cord was drawn cephalad. Tension was thereby imposed on the spinal nerves, particularly at their angulations through the spinal foramina and at their attachments to the cord. It is postulated that movement imposed on the nerves during such tension may cause irritation of the fibers with the production of referred pain.

WALTER H. NADLER, M.D.

Sabin, A. B.: The Pathology and Pathogenesis of Human Poliomyelitis. *J. Am. M. Ass.*, 1942, 120: 506.

The sequence of pathological changes in human poliomyelitis is necrosis of the anterior-horn cell and invasion by polymorphonuclear leucocytes, which ultimately arrange themselves over the dead neurons to form the typical focus of neuronophagia. After several days the leucocytes disappear and their place is taken by glial cells. Associated with this there is usually also an interstitial and perivascular infiltration. The cells present in the meninges represent an overflow from the perivascular spaces and are thus secondary to neuronal damage rather than the result of a true meningitis. Inflammatory reaction is therefore the result rather than the cause of neuronal damage.

Since 1929 it has been recognized that not only the spinal cord and medulla are affected in human poliomyelitis, but also the cerebral cortex, especially in those areas corresponding to the motor projection and association centers. It is worth considering the possibility that as regards certain muscle groups, the upper motor neurons concerned in initiating voluntary movement may be significantly and predominantly affected.

The pathological basis of the mild and transitory character of some types of paralysis encountered in poliomyelitis may be interpreted as indicating (1) that even when actual destruction of the lower motor neurons occurs the segmental distribution may be so spotty as not to affect the major innervation of a given muscle, and (2) the virus need not necessarily result in irreversible death of the neuron but it can produce partial degenerative changes from which the cell may recover. These findings are not in accord with the older but still current belief that the transitory character of some paralysis is due to the disappearance of the edema and inflammatory exudate which temporarily interfered with the function of the nerve cells.

A study of the distribution of virus in various parts of the body of persons dying of poliomyelitis indicated that it is found predominantly in the nervous system and alimentary tract. Its absence from the nasal mucosa, olfactory bulbs, and rhinencephalic centers indicates that the olfactory pathway is not the usual port of entry of the virus. Many lines of evidence indicate that the part of the central nervous system first to be attacked by the virus is determined by the neural connections of the peripheral tissue from which the virus invades, and that subsequent spread within the nervous system is dependent upon the central connections of the neurons in which the greatest proliferation of the virus occurs. Since in human beings the virus is predominantly situated in the alimentary tract, invasion probably occurs along the neural connections between it and the central nervous system.

HENRY C. FALK, M.D.

Ober, F. R.: Pain and Tenderness During the Acute Stage of Poliomyelitis. *J. Am. M. Ass.*, 1942, 120: 514.

The essentials of treatment in the early stages of poliomyelitis are expert nursing, early hydrotherapy with hot wet packs, gentle passive movements within the range of pain to prevent muscle and joint stiffness, and active exercises as soon as spasm and soreness have disappeared. Nursing care should be given by one specially trained in the principles of physical therapy in this disease as has been so well demonstrated by Sister Kenny. Many physicians do not understand the indications and methods of application of physical therapy, which if improperly used may do more harm than good. Prolonged immobilization, particularly if the position of the extremity is forcibly corrected, causes muscle and joint stiffness and delays recovery. In the first few days of an attack of poliomyelitis all structures of the spinal cord show evidence of inflammation and the lesion is not limited to the anterior horns. Pain with muscle spasm, bone growth changes, vascular disturbances, a general hyperesthesia, and deep muscle sensitivity are all present. With the deep muscle tenderness there is frequent muscle spasm, and it is very important to recognize these symptoms early and before the stage of flaccid paralysis

Spasm may be seen and felt and tenderness elicited by gentle steady pressure or stretching of the involved muscles. These muscle changes may produce later deformities unless they are prevented by prolonged rest with moist heat and maintenance of the parts in positions of maximum comfort. Flexible wire splints are most adaptable to the latter purpose. Muscle stretching and complete immobilization are to be avoided, but gentle passive movements should be used daily. This program of treatment may not effect a complete recovery but it will tend to lessen the degree of permanent crippling.

CHESTER C. GUY, M.D.

McCarroll, H. R.: The Role of Physical Therapy in the Early Treatment of Poliomyelitis. *J. Am. M. Ass.*, 1942, 120: 517.

This article reports the end-results obtained in 245 cases of poliomyelitis involving 487 extremities during the years from 1935 to 1941. Various forms of treatment were used and the cases are divided into five groups, in one of which no treatment was used other than bed rest. In the four other groups, immobilization and physical therapy were used in various proportions. The results are further subdivided as to the degree of original involvement. The conclusion reached is that the end-result in anterior poliomyelitis can be more adequately explained on the basis of the underlying pathological process than on the form of the early treatment used.

The author briefly reviews the various treatments advocated for this disease in the last twenty-five years, including Sister Kenny's method, which is referred to as "the newest and most popular fad." The essential pathological change in the spinal cord is well recognized but is apparently overlooked by orthopedic surgeons, to say nothing of the physical therapists, when attention is entirely devoted to the treatment of the secondary effects in the muscles themselves. When the anterior horn cells are completely destroyed, the muscles supplied by these cells will be permanently paralyzed; when they are temporarily affected by edema without actual destruction, a complete recovery will result; and when they are partially destroyed there will be only a partial return of function. No amount of physical therapy to the involved extremity can possibly affect the changes in the spinal cord, and these alone determine the eventual result.

The article closes with an appeal for the utilization of funds for study on the immunology and prevention of poliomyelitis, rather than on its cure, for the author believes that physical therapy will never prove to be the answer to the problems in this disease.

CHESTER C. GUY, M.D.

Mayer, L., and Greenberg, B. B.: Measurements of the Strength of Trunk Muscles. *J. Bone Surg.*, 1942, 24: 842.

The authors have developed a swivel table which offers a means of evaluating the power of trunk muscles more accurately than by previous means. In testing the strength of trunk muscles in normal subjects it was found that up until fourteen years of age the strength of the trunk muscles in boys and that in girls roughly parallel one another. After this boys developed much more rapidly than girls. Thus a seventeen-year-old boy will have almost twice as much strength as a girl of the same age. The seventeen-year-old girl has no more strength in her trunk muscles than she had when she was fourteen. Other findings are of interest but are not yet conclusive when paralytic subjects are tested. It is quite probable that in the future more may be learned through such tests about postural defects, painful backs, scoliosis, as well as about the residual paralyses of poliomyelitis.

ROBERT T. MCELVENNY, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Farquharson, E. L.: The Treatment of Varicose Veins in Soldiers. *Brit. M. J.*, 1942, 2: 450.

The author describes an ingenious method of treating varicosities in military patients. Considered in the light of its effect on a soldier's efficiency and the short time required for recovery, this method is very efficacious and therefore highly recommendable. Farquharson states that the affected vein often shows a condition of ectasia rather than a true varicosity and that veins of this type do not respond well to injection methods. Regular systematic treatment is often impossible because of continual movement of the troops, and re-postings. Many soldiers having had haphazard injections with no effect whatsoever, or only temporary relief, distrust and refuse injection treatment. The Trendelenburg operation when not combined with injections is frequently disappointing, and the military patients must be hospitalized when subjected to this operation.

Fig. 1. Subcutaneous ligatures at A and B. The first injection was given as shown, and the second at the point marked C. Twenty cubic centimeters of 20 per cent saline solution were injected in each situation.

The technique of this operation is illustrated in Figure 1. A stitch is passed around the vein, and tied over a small gauze pad placed on the skin. The vein is ligated at its highest visible or palpable point except when the varicosity extends right up to the saphenous opening. Generally the upper or middle third of the thigh or the medial side of the knee is chosen for the stitch and a second ligature is applied at the knee level. The ligatures are easily applied with the patient standing. Silkworm-gut threaded on a fairly fine curved skin needle is best for this purpose. The needle is passed around the vein, to transfix the skin about ¼ in. on each side of it, and the gut is tied over a small roll of gauze the thickness of a finger. No anesthesia is necessary.

Injection of up to 50 cc. of a 20 per cent saline solution can safely be used at one treatment. From 10 to 20 cc. are injected below each ligature. A widespread thrombosis can usually be obtained by this method. Cramping pain is felt about fifteen seconds after the injection; it is fairly severe for thirty seconds, but it usually passes off in two minutes.

If the dilatation extends to the saphenous opening, a modified Trendelenburg operation is done as follows:

An open ligature is carried out, but no widespread dissection is attempted. The vein is exposed by a ½ in. incision at its highest point and is divided. From 10 to 20 cc. of the saline solution are injected into the cut lower end before this is ligated.

After treatment the presence of the ligature *in situ* causes little discomfort, and, considering the extent of the thrombosis produced, the reaction is not severe. Generally the patient returns to his unit with a recommendation to be excused from duty for forty-eight hours and kept on light duty until he reports for removal of the ligatures in seven days. Patients with extensive dilatations are hospitalized one or two nights for the purpose of having the legs firmly bandaged to compress the veins and to reduce the size of the ultimate thrombosis. Even after the modified Trendelenburg operation two weeks will usually find the patient back for full duty.

The immediate results of treatment are excellent. Of 150 soldiers the majority required only one treatment for each affected leg. About 50 per cent had 2 ligatures applied—1 in the thigh and 1 at knee level.

No claims are made regarding the late results because of the difficulties of follow-up examinations in service patients. Fresh varices may develop in the course of years to come, but this does not require serious consideration at the present time.

MATHIAS J. SEIFERT, M.D.

Caylor, H. D., Long, L., and Eisaman, J. L.: Arteriovenous Fistula. *Ann. Surg.*, 1942, 116: 470.

Derangement of cardiac function progressively increases when an arteriovenous fistula involves ves-

sels of considerable size. The systolic pressure and total blood volume is increased in order to maintain adequate circulation to the capillaries. The artery proximal to the fistula becomes enormously dilated because of the increased blood flow, and this causes further enlargement of the fistulous opening. The establishment of this vicious cycle leads to congestive heart failure.

Arterialization of the veins is caused by increased work and adaptation to heightened pressure, and venification of the arteries is noted as thinning, tortuosity, and dilatation proximal to the fistula. Intermittent claudication, chronic ulcer, engorged veins, and cyanosis of the involved extremity are results of the fistula and the impaired circulation distal to the opening. The size of the fistula and the seriousness of the cardiac damage seem directly related to Branham's bradycardia phenomenon. The arteriovenous aneurysm is a powerful stimulant to the development of collateral circulation in the affected extremity, and it is because of this collateral circulation that portions of the artery and vein can be ligated and excised.

A man, aged twenty, presented himself at the Clinic in December, 1936, complaining of a swollen left leg. Five years previously the patient shot himself in the inner side of the left thigh at about the junction of the lower and middle third. A roentgenogram revealed that the bullet was lodged in the popliteal space. No attempt was made to remove it. The leg was swollen three or four times normal size and has remained so ever since. In about nine weeks the patient could walk with the heel of the left foot to the ground.

When enrolled in a C.C.C. camp, he was given a hypodermic injection of a vaccine for immunization three times. After each injection the leg became swollen, and after the third injection the great tumefaction persisted for a week and was not altered by overnight rest.

Soon after the accident the patient noticed a thrill on the inner side of the left thigh, 4 or 5 cm. above and below the wound entrance and this has persisted. At the time of examination of the patient, a distinct vibration occurred with each cardiac cycle. Since the accident, the left foot has been warmer than the right. All superficial veins of the left thigh, leg, and foot were more prominent than those of the right.

The blood pressure of the left arm was 140/60, the pulse 100 and regular, and the temperature 98.6° F.

The left thigh was 10.5 cm. greater in circumference than the right; the left patella was 7.7 cm. greater in circumference than the right; and the left lower extremity was 2.1 cm. longer than the right.

A thrill was palpable on the inner aspect of the left thigh, extending from the wound of entrance down to the knee, and a bruit was heard in the same area. It was much more difficult to feel the pulsation of the left dorsalis pedis artery than of the contralateral vessel. The roentgenogram of the left knee revealed the bullet in the popliteal space. The chest roentgenogram showed cardiac dimensions near the upper limits of normal.

A tentative diagnosis of arteriovenous fistula was made. Operation was refused and the patient did not return for two years.

On his return most of his symptoms had become aggravated and, in addition, there were two lesions resembling varicose ulcers on the inner surface of the left leg about 4 cm. below the knee. The blood pressure of the left thigh was 140/60, of the right thigh 130/80. The blood pressure of the left arm was 130/60, of the right arm 130/60. The pulse rate remained 100 per minute. After a blood-pressure cuff on the left thigh was inflated sufficiently to close off the aneurysm the pulse rate dropped to 72 per minute within fifteen seconds. Twelve cubic centimeters of thorotrast were injected into the left femoral artery and roentgenograms were taken.

In the roentgenograms the popliteal artery appeared near the inner border of the thigh extending downward and mesially to the level approximately 22 cm. above the joint space where the fistula was seen as a rounded collection of the dye. The bullet was lodged on the lateral wall of the popliteal vein.

The electrocardiogram showed the pulse rate to be 100; there was sinus tachycardia and moderate deviation of the right axis. The urine was negative. The hemoglobin (S) was 93 per cent; the erythrocyte count 4,500,000; and the leukocyte count 14,000. The Kline test was negative. Temperature studies of the extremities with the thermocouple showed a higher temperature in the left thigh, leg, and dorsum of the foot, and a lower temperature in the left metatarsal area as compared with the right side.

An operation was done in February, 1938. A longitudinal skin incision was made over the popliteal space lateral to the semimembranosus and semitendinosus muscles. Dissection was carried down to the aneurysm which measured approximately 3.5 cm. in diameter, and was in the proximal part of the popliteal space. The artery was isolated from the opening in the adductors above the aneurysm and down through the popliteal space beyond the aneurysm. The popliteal artery distal to the aneurysm was smaller than the part proximal to it (0.3 cm. distal and 0.5 cm. proximal). The popliteal vein was greatly dilated distal to the fistula and a stream of blood from the opening between the artery and vein could be seen through the vein wall going in a retrograde direction down the vein. The popliteal vein and artery lay side by side with the aneurysm protruding posteriorly. Pressure on the proximal popliteal artery stopped the purr over the aneurysm. The fistulous opening was about 0.5 cm. in diameter. All four vascular limbs of the aneurysm were doubly ligated with No. 3 chromic catgut according to the technique described by Horsley and Bigger. The fascia was closed with No. 1 plain catgut and a rubber dam drain was inserted down to the fistula. The skin was closed with silk.

The first postoperative day the blood pressure was 120/80 and the pulse 104. On the fourth day the

wound was dressed and the rubber dam drain removed. At no time in these first four days was there ever any evidence of impaired circulation in the left foot or leg. On the tenth postoperative day the patient was in a wheel chair and the pulse rate varied from 64 to 80 in comparison to the pulse rate of 88 when the patient entered the hospital. All sutures were removed on the thirteenth day, and the patient was dismissed walking on crutches the next day.

Three years after the operation, the transverse diameter of the heart had diminished 2.8 cm. and the aorta 0.4 cm. The area of the heart and great vessels was decreased by 45 sq. cm.

This case illustrates most of the features seen in an arteriovenous fistula occurring early in life. The affected leg was longer than its mate, larger in circumference, warmer, and exhibited varicose veins and ulcers. The blood pressure and pulse pressure revealed the changes of hypertension: low diastolic pressure and large pulse pressure. The heart was enlarged and Branham's bradycardia phenomenon was demonstrated.

A contemplated operation on an arteriovenous fistula should be delayed until an adequate collateral circulation has been established. This can be determined in part by thermocouple studies of the skin temperature. In this case a double ligation of each limb of the aneurysm was performed and the patient has been perfectly well for three years.

ALFRED B. LONGACRE, M.D.

Wheeler, Sir W. I. deC.: Ligature of the Innominate Artery for Right Subclavian Aneurysm; End-Result. *Brit. M. J.*, 1942, 2: 422.

This report deals with a thirty-five-year-old man who had been wounded in France in 1915. X-ray examination in 1932 revealed a portion of a bullet

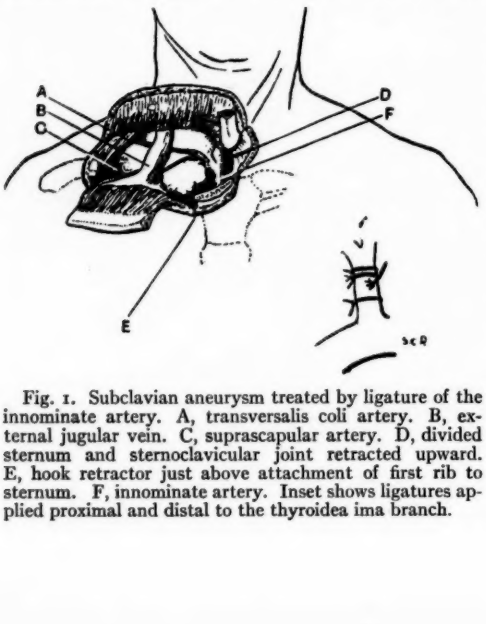

Fig. 1. Subclavian aneurysm treated by ligature of the innominate artery. A, transversalis coli artery. B, external jugular vein. C, suprascapular artery. D, divided sternum and sternoclavicular joint retracted upward. E, hook retractor just above attachment of first rib to sternum. F, innominate artery. Inset shows ligatures applied proximal and distal to the thyroidea ima branch.

deep to the insertion of the right sternomastoid muscle. There was a pulsating swelling the size of a duck's egg above the clavicle. The right recurrent laryngeal nerve was paralyzed, but otherwise there was a striking absence of the more usual clinical signs of subclavian aneurysm.

It was hoped that ligature of the subclavian artery behind the scalenus-anticus muscle would be possible and that, later, distal ligature and excision of the sac could be accomplished, but on exposure the sac was found to extend to the bifurcation of the innominate artery, which made proximal ligation of the subclavian artery impossible. The surgical approach consisted in dividing the clavicle in two places so that the central portion with its pectoral attachments could be turned downward on the chest. This gave ample room for exploration but not enough to permit safe ligature of the innominate artery. Enough room was obtained by clearing the back and front of the manubrium sterni, which is closely related to the sternoclavicular joint, and dividing this portion with a chisel without interfering with the first costal cartilage. The divided portion of the sternum with the sternoclavicular joint was retracted upward and to the left, which exposed the innominate artery in its entire length. Two No. 2 catgut ligatures were passed around the main artery distal to the thyroidea ima branch and tied slowly and gently to avoid rupture of the muscular coats. Pulsation in the aneurysm ceased and the radial pulse disappeared. A third ligature was placed nearer the aorta. The divided clavicle and portion of the sternum were replaced and held by sutures through drill holes in the bone. In three days the radial pulse reappeared and in a week was of normal volume.

Six weeks later some faint pulsation could be felt in a very small swelling at the site of the original sac, but the pulsation had disappeared four months after operation. Six years later examination revealed a small lump but no pulsation or thrill. The patient died suddenly eight years and four months after operation, presumably from rupture of an aneurysmal sac. No details could be obtained.

It is pointed out that the operation is only palliative, although a few surprisingly good results are on record. The majority of the "cures" and "successes" reported after operation on aneurysm of the aorta or its main branches are recorded when only a few weeks or months have elapsed. Whatever operation is employed, the life of the patient may be prolonged, but he remains in a state of perpetual jeopardy and seldom survives for many years.

JOHN L. LINDQUIST, M.D.

Swartley, W. B., Weeder, S. D., and McLaughlin, E. F.: Thrombosis and Gangrene of the Right Arm, Associated with Polycythemia Vera; Its Relation to "Effort Thrombosis." *Ann. Surg.*, 1942, 116: 184.

A case of thrombosis in the vessels of the arm accompanied by massive swelling extending to the

chest wall and neck in a patient with polycythemia vera is reported. Seven other such cases have been traced in the literature. The authors' case was the only one in which the process resulted in gangrene.

Thrombosis is not at all unusual as a complication of polycythemia vera (Vaquez' or Osler's disease). In fact, about one-third to one-half of the deaths ascribed to this disease are traceable to thromboses of mesenteric, cerebral, coronary, or other vessels, but the involvement of the veins of an upper extremity is extremely rare.

The authors believe, as did Lohr, that an unrecognized polycythemia vera may underlie a certain number of cases of so-called "effort thrombosis." It should be carefully sought in each future case to prove or disprove this contention.

With the overabundance of erythrocytes and with hematocrit values well above normal, the viscosity of the blood in polycythemia vera is increased and the rate of flow probably reduced. Add to these predisposing conditions some precipitating factor and thrombosis results. Thrombosis of vessels in the lower arm, forearm, or wrist, plus the extensive lymphatic stasis which follows may explain many cases incorrectly designated as examples of subclavian or axillary thrombosis.

As to the gangrene formation, it was due, no doubt, to the backing up of resistance to the flow of arterial blood until tissues no longer received adequate nourishment. The gangrenous process then extended up to the arterial tree a certain distance, aided by the arteriosclerosis present. That the original thrombosis was, in itself, massive enough to accomplish all this is unlikely, but that a pernicious progressive occlusive process was initiated is more plausible.

The symptoms were: painless swelling, slight tenderness, deep red cyanosis, with gradual extension of the process to the shoulder and chest wall. Cordlike prominence of the veins was noted only in the external jugular vein. Pulses at the wrist remained normal until the gangrenous process shut them off.

In a patient suffering from a thrombosis, increased red cell and hemoglobin values call for therapeutic bloodletting, regardless of whether the condition can be accurately diagnosed as a true polycythemia or not. If gangrene is inevitable, it is wise to await the line of demarcation and then amputate.

Since the question of compensation may arise in cases of "effort thrombosis" it is well to establish the presence or absence of polycythemia vera in such cases.

JOSEPH K. NARAT, M.D.

BLOOD; TRANSFUSION

Beattie, J., and Collard, H. B.: Plasma Protein Concentration after Hemorrhage. *Brit. M. J.*, 1942, 2: 301.

The authors note that it is generally assumed that the fluid from the tissue spaces which enters the blood stream to restore the blood volume after hemorrhage is weak in plasma proteins. There are few data, however, on the replacement of plasma proteins from existing stores in the early hours after hemorrhage. Experiments are recorded that throw some light on the movement of plasma protein in the blood stream during the first two hours after known quantities of blood have been withdrawn from the circulation. The observations are made showing the hemoglobin and plasma proteins in (1) single hemorrhages, (2) hemorrhages followed by blood transfusion, and (3) hemorrhages followed by plasma transfusion.

The authors conclude that it is clear from these experiments that after hemorrhage the restoration of blood volume is independent of the restoration of plasma protein. Restoration of both concurrently would imply considerable protein stores. The speed of blood-volume restoration in the cat apparently always outstrips the rate of plasma protein movement into the blood stream. In man, the data of Wallace and Sharpey-Schafer make it clear that even after large hemorrhages the plasma protein concentration can remain unchanged, although blood dilution is proceeding rapidly. One subject apparently restored his blood volume, after a hemorrhage of 750 cc., within four hours, and at the end of that time had increased his plasma protein concentration from 6.6 to 6.9 gm. per 100 cc. This subject had a blood volume of 4 liters before hemorrhage and one of 4.2 liters after hemorrhage.

After hemorrhage and subsequent dilution of the blood, a blood transfusion is followed by a rapid increase in hemoglobin concentration. This hemoconcentration is not pathological, but is due entirely to fluid movement out of the blood stream. The restoration of the blood volume to its prehemorrhage level takes place independently of the movement of erythrocytes into the blood stores or of plasma proteins out of the circulation. The movement of erythrocytes out of active circulation after blood transfusion would be expected to give a plasma protein value that was lower than the observed value. The fact that this was not the case in any animal even more strongly suggests that there had been rapid movement of plasma protein out of the circulation.

In summary the authors state that there is evidence of movement of plasma proteins into the blood stream within two hours after hemorrhage in cats anesthetized with nembutal. Blood transfusions at varying times after hemorrhage are followed by movement of plasma proteins out of the circulation within one hour of completion of the transfusions. Plasma transfusions after hemorrhage are followed by plasma protein movement out of the circulation within one hour of completion of the transfusions. The rate and amount of plasma protein movement into the circulation are independent of the amount or rate of bleeding, the amount or rate of dilution by fluid from the tissue spaces, and the blood pressure changes. The amount of plasma protein contributed to the blood, and, therefore, the plasma protein concentration at any time after hem-

orrhage (provided no food containing protein has been administered), is probably dependent on the state of the plasma protein stores outside of the circulation. HERBERT F. THURSTON, M.D.

Rigdon, R. H., and Haynes, A.: Observations on the Failure of Heparin to Inhibit the Clotting of Blood *in Vitro* by Staphylococci. *Ann. Surg.*, 1942, 116: 430.

Certain strains of staphylococci which contain the so-called "coalase factor" will produce the clotting of citrated plasma. This "coalase factor" is considered to be different from the toxin that produces hemolysis and tissue necrosis. Cobra venom, chlorozal-fast pink, peptone, and the anticoagulant hirudin do not inhibit the clotting of plasma by staphylococci. Walton demonstrated that heparin has no effect on the clotting of citrated plasma as produced by a staphylococci Berkefeld-V filtrate.

Cultures of the following staphylococci were used in these studies:

Strain A—Staphylococcus aureus—Stock culture
B—Staphylococcus aureus—Otitis media
C—Staphylococcus albus—Otitis media
D—Staphylococcus aureus—Otitis media
E—Staphylococcus albus—Skin of arm, no lesions
F—Staphylococcus citreus—Skin of arms, no lesions
G—Staphylococcus aureus—Stock culture

All of these strains were nonhemolytic. Before the organisms were added to citrated plasma or whole blood, they were grown in nutrient broth for from four to twenty-four hours. The amount of the inoculum was 0.1 cc.

The citrated human blood and plasma was usually from syphilitic patients. The sodium-citrate concentration was 0.4 per cent. Rabbits' blood was obtained by bleeding the animals from the heart. The concentration of sodium citrate in this was 0.77 per cent, and the rabbit plasma contained the same quantity of citrate as the blood.

Four cubic centimeters of either blood or plasma were used in some of the experiments, while in others the plasma was diluted to three parts of plasma and one of saline solution. The volume of the constituents was kept constant. Test tubes were kept in a water bath at 37.5°C. for two hours, and then in an incubator for varying periods up to forty-eight hours.

The human and the rabbit blood were defibrinated with glass beads. Complete hemolysis of 2.0 cc. of a 1.0 per cent suspension of rabbits' red cells was caused by 0.02 cc. of staphylococcus toxin. The toxin was detoxified by heating it for five hours in a water bath at 56°C. One cubic centimeter of this heated toxin did not lyse the concentration of rabbits' cells.

Heparin was used with sodium citrate and also as the only anticoagulant. When used as the only anticoagulant, one part of heparin was added to three of rabbit blood. Various quantities of heparin were added to the citrated plasma and the citrated blood. One cubic centimeter of this preparation contained 10 mgm. of the sodium salt of heparin.

When the suspension of staphylococci was used, the organisms were grown on the surface of agar slants for forty-eight hours. They were washed from the agar surface and again washed four times in large amounts of saline solution. The bacteria were then suspended in saline solution. The following dilutions of the saline suspension of staphylococci were used: undiluted 1 to 10 and 1 to 100.

The rate at which the clot formed varied in the rabbit and the human blood and there was variation in the clotting time of the different batches of citrated plasma. The clotting time was influenced by the age and size of the inoculum. When 0.1 cc. of a twenty-four-hour broth culture was used, clotting occurred more rapidly than it did when an equal quantity of a five-hour growth was added.

In the human blood and in the citrated human plasma, the clotting frequently remained for forty-eight hours, but the clot in the rabbits' blood began to liquefy after six hours and sometimes had returned to the fluid state after twenty-four hours. Shortly after the clot developed, hemolysis occurred in the rabbits' blood. The rate of liquefaction of the clot in the rabbits' blood increased with the increase in the degree of hemolysis. The strains of staphylococcus that did not produce clotting did not lyse the red cells. No hemolysis occurred in tubes containing the human blood.

The clots were dissolved through the effect of the toxin liberated by the staphylococci. The tubes of the citrated human plasma were inoculated with strains of staphylococci that produced clotting. One cubic centimeter of staphylococcus toxin was added when a clot was well formed. This amount of toxin did not produce macroscopic changes in the clot during forty-eight hours of incubation at 37.5°C.

Five-tenths (0.5) cubic centimeter of staphylococcus toxin was added to a series of tubes containing rabbit plasma following the appearance of a clot. An equal amount of heated toxin was added to a second series for the control. The clot produced by some strains of staphylococcus was decreased in size and appeared softer in consistency after twenty hours of incubation. Staphylococcus toxin apparently had no effect on the clots in human plasma.

The age of the broth culture and the amount of growth influenced the rate of development of the clots. In order to further this study, the G strain of staphylococci was grown on the surface of an agar slant. The organisms were washed and suspended in saline solution. One group of tubes containing 4 cc. of citrated human plasma was inoculated with 0.1 cc. of this suspension of organisms. A second series was inoculated with a 1 to 10 dilution, and a third with a 1 to 100 dilution. The tubes inoculated with the concentrated suspension of organisms were clotted after three hours of incubation. Those inoculated with the 1 to 10 dilution were clotted after eighteen hours, and those inoculated with the

dilute suspension were clotted only after forty-eight hours.

These observations suggest that the clotting of citrated human plasma results from either some substance or some change in the medium produced by growing staphylococci. When the strains of staphylococci that produced clotting of citrated blood and plasma were inoculated into tubes of defibrinated blood, they did not produce any clotting.

Certain strains of staphylococci will produce clotting when added to citrated blood and citrated plasma. The effect of the anticoagulant, heparin, was studied on the formation of these clots by the different strains of staphylococci. One cubic centimeter of heparin was put into each of four sets of tubes. Three cubic centimeters of citrated human blood were added to one set of tubes, a corresponding amount of citrated human plasma was added to the second set, and an equal quantity of citrated rabbit blood was added to the third. Each tube was inoculated with 0.1 cc. of a broth culture of the seven strains of staphylococci. Clotting occurred in the tubes with the heparin as well as in the controls in which 1 cc. of saline solution was added.

Rabbit blood was put into a flask with heparin, 1 part heparin and 3 parts blood, and 4 cc. of this blood was then put into each of a group of test tubes. These tubes were inoculated with a broth culture of staphylococci. Clots formed in this blood in the presence of a 25 per cent concentration of heparin as readily as they did in the citrated rabbit blood in which saline solution was substituted for the heparin. The failure of heparin to inhibit the clotting of both citrated plasma and citrated blood in the presence of certain strains of staphylococci was not the result of the neutralization of the heparin by the sodium citrate.

Certain strains of staphylococci when inoculated into citrated human plasma and citrated rabbit blood produced a clot. This clotting of citrated blood was similar to the clotting of citrated plasma by the coagulase-producing strains of staphylococci. Heparin had no inhibitory effect on the formation of clots by staphylococci in citrated plasma.

In order that clotting will occur fibrinogen must be present in the blood when the medium is inoculated with staphylococci. Rabbits' citrated blood and plasma were clotted more rapidly by the staphylococci used than the citrated human blood and plasma.

The filtrates from only certain strains of staphylococci can produce the clotting of citrated plasma. The process of clotting and that of hemolysis are produced by different substances. The clotting principle is distinct from the toxin responsible for local inflammation and fixation.

The dissolution of the clot in rabbits' blood and plasma occurred as a result of the effect of the toxin liberated by the growing staphylococci and by the toxin present in the filtrate. Human red blood cells were not lysed by the strains of staphylococci.

Heparin has no effect on the clotting of blood as produced by different strains of staphylococci. If heparin acts similarly *in vivo* and *in vitro* its effect on thrombophlebitis may be expected to differ with the different types of staphylococci.

ALFRED B. LONGACRE, M.D.

Belk, W. P., and Rosenstein, F.: The Survival, After Transfusion, of Human Erythrocytes That Have Been Stored in Citrate-Glucose. *Am. J. M. Sc.*, 1942, 204: 504.

In previous reports, the authors described their observations on the preservative qualities of citrated human blood stored at from 4 to 6° C., the survival after transfusion of the red cells so stored, and the preservative qualities of citrated human blood to which glucose has been added. The present report, the fourth and last of the series, describes the survival, after transfusion, of red blood cells preserved with the aid of glucose.

Summarizing this entire study, it may be said that chilled citrated blood undergoes rapid deterioration in all its cellular and in some of its plasma components. When such blood is administered to patients the red cells survive as long as those of fresh blood provided that storage has been no longer than two or three days. With each additional day of storage, however, they become progressively less useful to the patient, and after seven days of storage they are apparently treated by the human organism as foreign bodies and are eliminated in from twenty-four to forty-eight hours. The addition of glucose to citrated blood enhances its preservative properties about four times, as shown by both *in vitro* and *in vivo* studies. The erythrocytes of blood to which glucose has been added will, after storage of about fourteen days, be detectable in the recipient's blood stream (where they presumably function) for about fifty days. This survival is comparable to that of citrated cells stored for three or four days. It is not, however, as long as the survival of fresh unstored cells. The clotting properties of stored blood diminish with such rapidity that it seems wise to use only fresh blood in transfusion for those with hemorrhagic diatheses. In the treatment of sepsis a storage limit of five days is advisable.

It seems possible that the preoccupation of the medical profession at the present time with banks, both of whole blood and of plasma, has led us to forget that fresh whole blood is easily obtainable, and that it has distinct advantages over any substitute. The blood bank, in fact, necessitates some compromises with the very best technique of blood transfusion. These compromises are: the use of the universal donor for many patients, a practice which has resulted fatally in a small per cent of cases; the use (usually) of nonfasting donors, a practice of considerable danger to food allergic recipients; the filtering of blood, usually through gauze which imparts lint; and the use of blood which has undergone at least some deterioration in the cells and in the components of the plasma. The bank offers certain advantages to be set against these objections: namely, the greater rapidity with which blood may

be supplied in emergencies; the performance of tests for syphilis by skilled rather than by unskilled workers; and the avoidance of the confusion and inconvenience incident to the selecting of individual donors of fresh blood. On the whole, in routine practice in larger hospitals where blood is not stored too long, the blood bank would seem to offer more advantages than disadvantages to the average patient. Recourse, however, to fresh whole unfiltered blood of homologous type from fasting donors should still be practiced in selected cases.

J. M. MORA, M.D.

Sharpey-Schafer, E. P., and Wallace, J.: Circulatory Overloading after Rapid Intravenous Injections. *Brit. M. J.*, 1942, 2: 304.

Authorities differ widely in advising the amount of serum or blood to be injected and the rate at which it should be given. Many stress the dangers of overloading the circulation. This article reports the results of rapid intravenous injections of serum, saline solution, and, in a few cases, blood, on the venous pressure and certain other cardiovascular measurements.

The observations were made on convalescent subjects without cardiovascular disease. The technique of the observation is described in detail. It was found that when the rate of injection was between 50 and 150 cc. a minute, the venous pressure began to rise after 1,000 cc. of saline solution or serum had been given, and reached a maximum toward the end of the injection. If the rate of injection was very rapid, as little as 500 cc. raised the venous pressure once the injection had been stopped. Saline solution often left the circulation quickly, as indicated by a rising hemoglobin percentage. The venous pressure still fell in a matter of minutes, however, if the hemoglobin remained at the lower postinjection level. Measurement of the vital capacity and studies of the heart rate with roentgenographs of the heart and the electrocardiograph were made and recorded. Subjective symptoms in subjects were noted and described.

The authors state in summarizing that up to 2,000 cc. of saline solution, serum, and blood were injected into the subjects without cardiovascular disease at rates of from 54 to 168 cc. a minute. The venous pressure was raised up to 11 cm. H_2O when there was considerable retention of injected fluid in the circulation, as indicated by the fall in hemoglobin. Roentgenographs revealed an increase in the diastolic size of the heart, enlargement of the pulmonary arteries, and prominence of the vascular markings in the lung fields. Vital capacity was diminished, but there was no evidence of pulmonary edema. In spite of the rise of venous pressure many subjects had no increase in heart rate. Of 12 subjects, 4 showed electrocardiographic changes indicating slight stress of the right side of the heart. Symptoms were absent or unimportant. There was a rapid fall of the venous pressure to normal when the injection was stopped, except in one subject given blood. There is evidence that the peripheral and pulmonary capillaries and veins dilate to accommodate the increased blood volume. When the blood volume was first reduced by a large venesection, saline solution or serum injected in similar amounts and at similar rates caused little or no rise of the venous pressure.

HERBERT F. THURSTON, M.D.

Wood, I. J.: Some Observations on Transfusion in the Middle East. *Med. J. Australia*, 1942, 2: 97.

For two years the author was engaged in transfusion work in the middle east with two different units. He describes the special equipment of a transfusion unit, the personnel of the surgical team, and the procedure at a main dressing station. He stresses that resuscitation should be carried out as close to the front line as possible. In addition to warmth, drinks, and morphine, it will be necessary to give fluids intravenously to 5 per cent or more of the wounded.

Every medical unit should have one or more officers and at least four other ranks thoroughly trained in transfusion technique. Each unit must provide suitable rooms or tents for this work. When an action is pending, resuscitation teams should be sent forward to the advanced units from general hospitals and casualty-clearing stations. Those working in resuscitation units must learn to use their eyes, their hands, and perhaps a sphygmomanometer and a hemoglobinometer. They should be young, enthusiastic, placid, and painstaking.

Blood is the best fluid for the treatment of hemorrhage. Serum is of value for hemorrhage when blood is not available, for shock associated with little or no hemorrhage, and for burns. Glucose and saline solution is of value in the presence of vomiting, especially in abdominal wounds, and for dehydration generally. Moreover, as an adjunct to blood or serum it is of benefit in shock and hemorrhage. This is an important empirical observation.

Patients requiring transfusion will need at least 1 litre of fluid, no matter whether it is blood, serum, or glucose and saline solution. Often they will require more. At advanced and main dressing stations, serum and glucose and saline solution will be of benefit. If possible, blood should be brought to the casualty-clearing stations and to the main dressing stations from a reliable blood bank. Coramine and neosynephrin will often aid resuscitation if added to the fluid given intravenously. Sulfanilamide may be given in the fluid if abdominal wounds are present. At base hospitals blood storage may be carried out by skilled workers under conditions of strict asepsis and bacteriological control.

Chronic sepsis causes progressive anemia. This is insidious and often passes unrecognized. Weekly hemoglobin estimations are essential. The treatment consists of adequate drainage, a liberal diet rich in vitamins, protein, and iron, and adequate transfusions of fresh blood. Amputation must not be delayed for too long a time.

HERBERT F. THURSTON, M.D.

RETICULOENDOTHELIAL SYSTEM

Alessandri, H., Matus, M., Etcheverry, R., and Martinez, F.: Splenectomy in Werlhof's Disease (La esplenectomia en la enfermedad de Werlhof). *Rev. méd. Chile*, 1942, 70: 571.

In the past six years the authors have seen 34 cases of Werlhof's disease (25 in women and 9 in men). Splenectomy was performed in 10 of these cases (in 7 women and 3 men). In 6 of these cases the patients had had the disease for more than four years with remissions and exacerbations; in 1 case the disease had lasted for about five months; and in the three remaining cases operation was performed during the first attack.

The most striking features of the disease are hemorrhage and anemia. The anemia is generally moderate, microcytic, hypochromic, and moderately regenerative, and it is characterized particularly by a very low platelet count, probably due to disturbed function of the bone marrow.

At present the most effective treatment of the disease is splenectomy. Five of the 24 patients not operated on (21 per cent) died of cerebromeningeal hemorrhage. Among the patients operated on there were no immediate postoperative deaths.

Before splenectomy is done the diagnosis of Werlhof's disease must be established by the exclusion of toxic and infectious blood diseases. If the case is mild, operation may be delayed and transfusion tried, but in moderate and severe cases operation should be performed at once to prevent meningeal hemorrhage. Although a high operative mortality has been reported in acute cases there were no deaths among the authors' 3 acute cases. Needless to say, transfusion should be given before the operation and if necessary during and soon after it.

The technique of the operation is described and some of the varying conditions that may be found on opening of the abdomen are discussed. As a rule the platelet count rises to above normal shortly after operation and then falls gradually to normal or a little above. The other symptoms improve on a parallel with the improvement in the platelet count.

Among these 10 cases 8 showed complete clinical and hematological restoration to normal. In 1 case the platelet count improved only temporarily and the patient died four months later of cerebromeningeal hemorrhage. This patient had a congenital hemorrhagic icterus and a valve lesion. In another case the improvement in the platelet count was only temporary. There was no serious operative shock in any of the cases, no postoperative hemorrhage, and no suppuration of the bed of the spleen. In some cases there was slight infection of the wound. The results suggest that the hypofunction of the bone marrow is caused by the spleen.

Details of the case histories and charts showing the postoperative course are given.

AUDREY G. MORGAN, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Miller, D.: Early Treatment of Battle Wounds of the Head. *Med. J. Australia*, 1942, 2: 207.

"During recent campaigns in the Western Desert the writer worked first as surgeon in a forward operating team, and later as officer commanding the British 'Head Centre' for the Middle East Forces. The knowledge gained in some aspects of head surgery in these conditions is likely to be applicable to warfare in Australia, where it is possible that campaigns may be conducted in circumstances and surroundings resembling the Western Desert.

"The fortunes and surprises of war force men from the path they may elect to follow, and while the surgeon versed only in general surgical techniques must at times be prepared to discharge the duties of a specialist branch, the man who essays to hold aloof from general work may be of little value in the emergencies of war surgery. The following are some of the points worthy of emphasis to anyone who may be called upon to deal with head wounds.

TIME OF TREATMENT OF HEAD WOUNDS

"Failure to perform primary suture and to obtain first intention healing of a head wound is a grave misfortune to the patient. Even simple scalp wounds, if they become infected, are very apt to result in necrosis of bone, extradural abscess or infective sinus thrombosis. They merit all the care of deeper wounds. The practice (now so generally and wisely adopted) of leaving battle wounds in other areas unsutured has no application in the surgery of the head, and must at almost all costs be avoided. This departure from usual practice was not generally realized, but cannot be too strongly stressed.

"The alternative to scrupulous *débridement* and closure of deeper wounds is infection, which means meningitis, cerebral abscess or an infected cerebral sinus. In the case of head wounds it is fortunate that the usual time limit of ten hours set for the *débridement* of wounds in other situations does not hold. Thorough surgical treatment of head wounds may justifiably be carried out after a much longer interval from the time of reception of the wound. This longer period of safety had come to be an accepted fact in civilian casualties, in which one may count on safety for about forty-eight hours; but in wounds in the Western Desert it was found that successful excision and closure with drainage were done as late as three or four days after the wound had been inflicted. The peculiar absence of gas gangrene and other severe infections and the use of sulphanilamide are responsible for this. Possibly conditions in Northern or Central Australia may prove to be the same.

"If we bear in mind also the fact, now abundantly proven, that patients stand transport very much better before an operation than after, it becomes an obvious teaching that casualties with head wounds should be given the benefit of their longer safe period, and be evacuated even for some distance to a suitable operating centre before being subjected to any active surgical measures. In such a centre it should be possible to nurse them for at least a short recovery period. Nothing is more fraught with danger than partial interference with such wounds in forward field units, from which an early and exhausting evacuation will have to be made.

"The following case is illustrative of primary treatment at a late stage. I sent and had returned this 'follow-up card' concerning a patient treated in a desert casualty clearing station.

"Three days after injury débridement of G.S.W. head, excision of wound and bone edges. Removal of damaged brain and of a large F.B. from the occipital lobe, wound closed without drainage.

"The patient was evacuated to a base hospital three days after operation. The 'follow-up card' was completed at the British Head Centre some weeks later:

"On admission rather drowsy, some neck stiffness, C.S.F. pressure 170 mm., slightly coloured C.S.F. Homonymous hemianopia. His wound healed by first intention, he made a rapid recovery, and is now able to walk well, though hemianopia persists. X-ray shows small pieces of metal scattered around the wound.

"Several such examples could be cited in support of the plea for utilizing this longer safe period, though naturally it must be remembered that early treatment under proper conditions is more likly to be successful. Many cases could be quoted, however, to show that infection and disaster are likely to follow early treatment which is inept or incomplete.

THE OPERATING CENTRE

"Counsels of perfection are unlikely to prevail in war, and the surgeon dealing with head wounds, though he cannot always be an experienced neurological surgeon, must be familiar with the techniques concerned especially in the care of damaged brain and in the skilful control of intracranial bleeding. Such things cannot be done with knowledge alone, but demand some basic equipment. The most important item is surgical suction. There is only one way to keep a head operation field clean, and that is by suction. Swabbing and pressure aggravate the trouble they aspire to stop, and may do irreparable damage. Australian Imperial Force surgical teams were equipped with a foot pump suction apparatus (perhaps exhausting to an orderly, but otherwise very satisfactory) in places where motor or water suction were not available. The sucker is used to remove blood from the field and to allow the bleeding vessel to be seen and accurately controlled. Cushing clips should be carried, as it is unlikely

that electro-surgical equipment will be available. Other necessary instruments are: bulb hand syringes for washing the wounds, good bone perforating instruments and good bone forceps. Surgeons will be repaid for care in seeing that their burrs, perforators and bone-cutting forceps are sharp.

SOME SPECIAL PROBLEMS

"In contradistinction to civil head injuries the majority of battle head injuries are open wounds, and most of the patients have suffered only local brain injury. In civil injuries the patient's head is usually thrown against some object, and the brain suffers as a whole; but the majority of battle head injuries are due to a small, high-velocity projectile striking one part of the head and causing only local cerebral damage. Usually in such cases there is no history of loss of consciousness, and until other influences are manifest the patients remain conscious and alert. The usual story is for a man to feel a hit on the head and immediately notice the local effect, such as hæmorrhage, or the possible neurological effect, such as a hemiplegia, monoplegia or hemianopia.

"A young Hussar officer was hit while in his tank. He had the sensation of seeing a piercing bright light, did not lose consciousness, but immediately became hemianopic and aphasic. He had a perforating wound of the left temporo-occipital region.

"Another young trooper, while fighting in his tank during a night battle, felt a hit on his head and noticed immediately that his left arm and hand were limp and powerless. He continued to fight throughout the night and at no time lost consciousness. He had received a localized right parietal lobe injury, and some weeks later recovered completely from his monoplegia.

"In all such cases, of course, the wound is the primary consideration.

SURGICAL TREATMENT OF WOUNDS OF UNCONSCIOUS PATIENTS

"In some instances patients do sustain a generalized brain injury, as evidenced by loss of consciousness, in addition to a local wound. In these cases the surgeon must decide whether or not he is to operate on the wound. It often appears almost certain that the patient will die as the result of the general head injury, and the surgeon, usually sorely pressed, begrudges the time and effort of performing an unnecessary operation. If, however, the patient survives the gross brain injury, he will then have to weather the hazards of an untreated head wound. When the time margin is available, it may well be used for observation; but when this period is drawing to an end the best practice is to treat the wound thoroughly, so that if the patient survives it will not further prejudice his recovery.

THE TECHNIQUE OF WOUND EXCISION

"'Pentothal sodium' is the best anæsthetic agent. It can be given satisfactorily in glucose and saline solution by the continuous drip method, or a single injection is useful during the painful shaving of the scalp or introduction of 'Novocain,' under the influence of which the operation may be completed.

"Good barbers' scissors, hair clippers and open blade razors are as invaluable as the orderly who knows how to use them. Much time is saved by expert shaving of the head. The shaved scalp should then be swabbed tediously for some minutes with spirit, and the wound securely draped off so as to allow the anæsthetist easy access to the patient's face without disturbance of the drapes. Thoroughness is the key word in excision of the wound. Free mobilization of scalp flaps will facilitate easy approximation over quite a wide gap. This is best done by pushing the gloved finger out under the galea. Bone edges are most easily excised by the use of sharp rongeur forceps, which as a rule can be introduced through the bone defect, or failing this, through a separate opening made for the purpose. This method is quicker, easier and as good as excision of a fracture *in toto*. Soiled and torn dura must, of course, be excised with scissors, and bleeding from the dural edge must be controlled either by silver clips or by an under-running suture. When no endotherm is to be had, the red-hot tip of a probe is useful to seal small bleeding points in the dura.

"An X-ray film may be available to give information about foreign bodies. I do not think this is important, as foreign bodies lying superficially in damaged brain are likely to be readily detected, and those which do not lie to hand are best left alone, until such time as their removal may be indicated. The method of gentle irrigation and suction of pulped brain is well known. If a rather stiff rubber catheter is used, it will readily detect foreign bodies. This gentle washing and sucking and a most cautious removal of foreign bodies should be persisted in, until a clean field is achieved. It may be difficult; but the surgeon must remember that irrigation and suction are the only permissible manœuvres, and at most swabbing must be limited to the placing of a small moist wool swab on a bleeding point. Hæmorrhage from most of such bleeding points will stop after a little warm lavage or may be controlled by a Cushing clip or a small suture. Attempts to use artery forceps will be followed by ever-increasing difficulties. Severe hæmorrhage may be encountered from blood sinuses; the only way to stop this is by muscle stamps. A piece of temporal muscle is usually available, and may be squeezed into a thin stamp and placed on the torn sinus while the sucker displays the tear. If it is held gently in place with a gloved finger for a few minutes, adhesion of the stamp and control of the bleeding result.

REMOVAL OF FOREIGN BODIES

"The majority of foreign bodies encountered were bone fragments, which were often literally sprayed deeply into the brain from a tangential wound. Metallic foreign bodies were nearly all non-magnetic. The removal of most foreign bodies is a dif-

ficult matter, because the brain gives no resistance against which the body may be grasped, and clumsy handling will only drive it further away and may easily cause perforation of the ventricle—a major tragedy. Ordinary types of forceps tend to push a slipping object away as they close on it. Forceps with a sugar-tong action avoid this difficulty. Deep or inaccessible foreign bodies should on no account be sought after.

LOCALIZED BRAIN DAMAGE AS AN INDICATION FOR SURGICAL MEASURES

"Misconceptions of cerebral pathology are responsible for unnecessary surgical procedures. There sometimes seemed to be an impression that a hemiplegia betokened a clot compression, and unnecessary exploratory operations were performed. It is well to remember that the outstanding feature of clot compression is loss of consciousness, paralysis being of secondary importance. It is more than improbable that a man who remains fully conscious is suffering from clot compression. Another explanation should be sought for the paralysis. These signs of localized brain damage were common after tangential wounds, which often had not even injured the skull.

"A gunner reached the base hospital ten days after being wounded. He had received a head injury, and after a short period of unconsciousness he had recovered with a right hemiplegia. On admission to hospital, he had obvious weakness of the face, arm and leg. He had an open scalp wound of the right parietal region, with no bone injury or penetration. He progressed to full motor recovery in about six weeks, though residual loss of joint sense persisted.

"Such brain damage was often extensive and recovered slowly.

"A private soldier had a penetrating wound of the right parietal region, and a small metallic foreign body was lying to the left of the sagittal plane. There had been practically no unconsciousness, but he suffered immediate complete left hemiplegia and considerable disturbance of voluntary power in the right arm. He had been subjected to an unnecessary decompression operation. After some weeks his right side had completely recovered and power was returning to his left side.

"If the surgeon remembers that increasing unconsciousness is the cardinal sign of compression, such patients will be spared the danger of unnecessary operations.

COMPOUND GUNSHOT WOUNDS INVOLVING THE ORBITAL ROOF

"When a perforating wound of the orbit has occurred, one must be aware that penetration of the cranial cavity through the orbital roof is a possibility. This at a later stage may result in meningitis or brain abscess. Four cases were treated in which this complication of severe damage to the eye was encountered. In two of the cases the eye had already been removed when brain tissue was noted in the orbital cavity. The procedure then adopted was to retract the lids well, gently wash and suck out the pulped brain, and remove loose fragments of the orbital roof. It is a good practice then to suture the lids together. In two cases in which this treatment was carried out a little cerebro-spinal fluid seeped out between the eyelids for a few days, and there was then no further anxiety.

"One patient whose lids had not been sutured was seen much later at the base hospital, and had developed an intraorbital *fungus cerebri*. He had severe meningitis; the cerebro-spinal fluid pressure was over 300 millimetres and the cell content was 1,200 per cubic millimetre. With general treatment he recovered and the *fungus cerebri* subsided.

GENERAL TREATMENT OF WOUNDS OF THE HEAD

"There is no doubt that the sulphonamides save many casualties with head wounds, and thus preserve for surgeons some problems of the late treatment not heretofore encountered. Sulphanilamide should be administered at the first dressing station. Confusion and difficulty were often caused by patients having no record of their early dosage. Special slips should be attached to the field medical card for this purpose. Where a patient's evacuation is a matter of doubt or chance, it is wise to give a very large initial dose of 'M & B 693' or sulphonamide.

"We found it necessary to make estimations of the concentration of sulphanilamide in the blood of patients arriving at the base with infective complications. A concentration of under 700 milligrammes *per centum* is too low, and the dosage should be 'pushed' until a satisfactory concentration is obtained. At the same time, the leucocytes should be watched. Lumbar puncture is performed in all cases when signs of intracranial infection are present, and the pressure is measured by a manometer and reduced to normal level. This should be done every day or more frequently if the pressure is high. It both affords relief and aids in the recovery process. The fluid intake and nutrition of patients are often a difficulty, as they may be vomiting or non-cooperative. When this is the case glucose and saline solution should be given intravenously and soluble 'M & B 693' may be administered in it.

SUMMARY

"Experiences of head surgery in Western Desert warfare are thought to be applicable to certain Australian conditions.

"The liability to infection is discussed, and the long period over which radical primary treatment can be applied is emphasized.

"Every effort must be made to excise and close all head wounds in contradistinction to wounds in other areas.

"Some technical points of primary treatment and immediate after-care are considered."

(ORIGINAL ARTICLE)

Latner, A. L.: The Low-Pressure Phase of Blast. *Lancet*, Lond., 1942, 243: 303.

The high-pressure component of the blast wave as the cause of blast lesions has been emphasized. The low-pressure phase has been neglected, and has not been regarded as a factor which can be primarily responsible for the production of lesions. It has, however, been suggested that this phase may aggravate the injuries already produced by the high-pressure component. Therefore, experiments were carried out to determine the effects of exposure to low pressures of exceedingly short duration. Mice were used as experimental animals.

It was found that exposure to rapidly produced low pressure of very short duration is capable of producing injuries similar to those produced by blast. Approximately half of the animals died instantly or within a short period. Typical blast lesions were produced, both intra- and extrathoracic. One may infer from this that the low-pressure phase of blast may possibly have an importance greater than that previously attributed to it.

In the treatment of blast injuries of the lung, immobilization of the chest with a bandage might prevent further bleeding into the lung. Covering of the chest with a tight bandage or jacket should help to prevent blast injury by checking overstretching of the lung substance. SAMUEL KAHN, M.D.

Webster, D. R., Woolhouse, F. M., and Johnston, J. L.: Immersion Foot. *J. Bone Surg.*, 1942, 24: 785.

"Immersion foot" is the name used to denote a condition produced by long immersion of the feet in extremely cold water, usually associated with immobility of the limbs and constriction of the limbs by boots and clothing. This is a similar condition to "trench foot" and "shelter foot."

This report is based on the observation of 142 cases of immersion foot at Camp Hill Hospital, Halifax, Nova Scotia.

This condition may occur in those exposed for long periods to subtropical waters and therefore cannot be classed as a true frostbite.

Sensory loss and hyperemia appear first and are followed in about ten days by intense neuritic pains, and, in severe cases, by varying degrees of gangrene.

Dry refrigeration appears to be successful in reducing tissue loss to a minimum. Dry cooling and refrigeration were achieved in the present series by the following means:

1. Application of ice bags. The traumatized feet were carefully swabbed off with alcohol; sterile pledgets of gauze were placed between the toes; and the whole foot in each case was covered with a sterile towel. During this procedure the feet were handled as little and as gently as possible. Five carefully dried ice bags were placed around each foot over the towel, and the whole enclosed in an oiled-silk bag. This was then wrapped in thick layers of cellucotton, and enclosed in rubber pillowcases loosely tied about the upper calf of the leg. The feet were then elevated on several pillows. The ice bags were changed every four hours except in those cases of extreme hyperemia in which more frequent changing was necessary to result in an average lowering of the temperature of the feet of about 6° C.

2. Dry cooling by exposure to fan. The feet were exposed and elevated in front of electric fans, which drove a continuous blast of air across the traumatized areas. To enhance cooling, the feet were repeatedly sprayed through the fan blades with cold water from a nebulizer.

3. Dry cooling at room temperature. The feet were elevated and completely exposed to room temperature in a cool ward.

Apparatus is being constructed which will produce uniform dry cold, and the results of the use of this apparatus will be reported later.

Return of sensation and complete motor control may be delayed for many weeks, and pain may recur on exposure to cold and wet.

First aid and hospitalization should be directed to avoidance of trauma, slow warming of the affected limbs, strict asepsis, and adequate supportive treatment.

SUGGESTED PROPHYLAXIS

Boots and any constricted footwear, if wet, should be removed, and oil or heavy grease should be generously applied to the feet while the seaman is exposed.

It is suggested that on rescue the patient should be lifted, if possible, and not permitted to walk. No massage should be attempted and the feet should be exposed and elevated and the patient given supportive treatment.

In the hospital strict asepsis should be maintained, and the feet should be cooled, if possible, during the hyperemic period.

The rationale of this treatment rests on the presumption that the tissue damage caused by the original trauma results in an intense vasodilatation, together with actual damage to the vessel walls and damage to peripheral nerves or end organs. A vicious circle is thus established, with a resulting edema and transudation of serum and blood, all of which further contribute to the already present oxygen debt in the involved part. This latter, in turn, leads to an increase in edema and transudation of whole blood.

Strict asepsis is essential in handling these cases because in those patients in whom infection developed in the damaged tissues of the feet, the infective process spread with great rapidity through all layers of the feet. This process was observed to occur in some cases without an apparent break in the skin surface. The heels are also prone to severe tissue damage, due to pressure, and should be carefully guarded by means of padded rings or suspension apparatus.

From the authors' clinical observations and from the small amount of histological material available, it is apparent that there is an extending thrombosis in the vessels adjacent to the traumatized area. It is suggested that heparin would be of value in the early cases showing gross pitting edema, blebs, mas-

sive extravasations of blood, and incipient gangrene. The authors state that their experience in the use of heparin is limited but they believe that in 1 case presenting a clinical picture of vascular occlusion, heparinization was responsible for saving the involved limb. In tissues irreparably damaged they believe that dry refrigeration, while postponing the inevitable gangrene, leads to a minimal tissue loss.

There are many unsolved problems in the study and treatment of immersion foot, such as nerve dysfunction, vascular damage, the formation of H substance, and remote toxic effects.

ROBERT P. MONTGOMERY, M.D.

Reid, W. G.: Drivers' Aptitude Tests of the Third Armored Division. *Mil. Surgeon*, 1942, 91: 401.

The author describes a series of rough tests devised to determine the physical fitness of drivers assigned to armored motor vehicles. These aptitude tests serve to eliminate individuals whose vision, reaction time, or sense of equilibrium is below the standard for army drivers. The tests are as follows:

1. Test for color blindness, with red, yellow, blue, and green yarns.

2. The field of vision test determined only in the horizontal plane and taken with both eyes open, using the examiner's fingers as test objects. The minimum for passing this test is 140 degrees.

3. The depth perception test determined by two different sets of equipment. One consists of a plane board surface about 2 ft. wide and 4 ft. long, on which are mounted two blocks of wood each measuring 4 in. by 4 in. by 2 in. Each block has a piece of 1 in. pipe projecting 4 in. from its upper surface. One block is fixed; the other can be moved forward or backward by a rope and pulleys. The applicant is seated twenty feet from the board and with his eyes on a level with the blocks, he attempts to set the movable block even with the fixed one. Two inches or more of average error are considered failures. The other test is more accurate. It consists of two narrow black metal rods in a white box, one fixed and the other movable. These are viewed through an aperture in one end of the box, and by moving a rope an attempt is made to adjust the movable rod even with the fixed one. An average error of less than 1½ in. in four attempts is permitted.

4. The glare blindness test. In a darkened room a sealed-beam automobile headlight operated by a storage battery is flashed in the applicant's eyes for 3 to 5 seconds at a distance of 30 feet. As soon as it is turned off a road sign of standard size is held up. This should be read within ten seconds after the light is turned off.

5. Time on one foot blindfolded test. The blindfolded applicant is directed to stand on one foot without falling or touching the other foot to the floor or leaning on any supporting wall for thirty seconds.

6. Walking rail test. The patient with eyes open must be able to walk 20 feet of a wooden rail, 22 feet long and as wide as a railroad rail raised about 6 in. from the floor.

7. Balance on log test. The patient must sit with arms and legs extended for sixty seconds without falling off a wooden log, 8 ft. long and 5 in. in diameter, and supported like a sawhorse above the floor.

8. The stability test is performed on a platform with an upright side and an adjustable horizontal bar to which is pinned a sheet of cardboard. A block of wood 6 in. by 3 in. by 1 in. with one surface concave fits the head and is held in place by an elastic chin strap. A pencil is placed vertically in a hole in the upper surface of the block with its writing end upward. The bar is then adjusted so that the pencil touches the cardboard lightly. The patient is directed to stand at attention for one minute. Any swaying is recorded by the pencil on the cardboard. Not more than 1½ in. of sway in any direction is required to pass.

9. Reaction time test. Upright slots with two horizontal bars across the front, a board calibrated in inches, and an ice pick are used for this test. The ice pick is held by the patient about 4 in. away and just above the horizontal bar in front of the slot. He attempts to stop the fall of the board by jabbing it with the ice pick. In order to pass, the board must be stopped within a drop of 13 in.

10. Visual acuity test. Visual acuity with correction of 20/40 or better in each eye is required.

An applicant who fails the tests is rechecked. However, a second failure is considered permanent and he is not allowed to drive an armored motor vehicle.

JOSHUA ZUCKERMAN, M.D.

Mathewson, F. A. L.: Medical Aspects of Aircrew Selection. *Canad. M. Ass. J.*, 1942, 47: 318.

Aviation medicine has become a specialty. The Royal Canadian Air Force medical officers receive special instruction at the School of Aviation Medicine, and to keep them abreast of recent developments, refresher courses are provided from time to time.

The chief problems are concerned with the selection and with the maintenance of personnel. Selection is a process of continually finer screening and does not end with preselection but is carried forward into the training program and is later applied to experienced personnel in whom particular qualities are sought for special types of flying. Standards are not fixed for new methods of aerial warfare, and changes in aircraft design and variations in teaching procedures must all be considered in respect to their possible effect on the aircrew personnel.

The author presents a general picture of aircrew selection and emphasizes some of its more important medical aspects. The following subjects receive discussion: limits of height and weight; visual standards including color vision and night visual capacity; upper respiratory infections and defects; cardiovascular defects; psychomotor co-ordination, and the psychological constitution. The writer believes that the introduction of gliding as a national recreation would serve as a natural method of selection.

WALTER H. NADLER, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Maliniac, J. W.: Free Skin Grafts versus Flaps in Surface Defects of the Face and Neck. *Am. J. Surg.*, 1942, 58: 100.

The author limits his discussion to grafts of the face and neck because of the special requirements of this region. In planning the reconstruction, determination of the real tissue loss is the first step. Other factors entering into consideration are the patient's mental attitude, financial status, sex, and age.

The main advantage of free skin grafts over flaps is the saving of time and expense in their application. However, on the face and neck the end-result of the graft must be carefully appraised.

Thin Thiersch grafts should not be used for permanent resurfacing of the face and neck, according to the author, because of their poor color and pronounced tendency to contract when applied to areas without a solid base, such as the cheeks and neck. Even as a lining for the nasal cavities, sulcus of the mouth, and orbit, the very thin graft should be discarded in favor of the thicker split graft to prevent excessive contraction. Thin grafts have a definite use as a temporary wound covering to be replaced later by a thicker graft or flap. This early, temporary resurfacing of wounds is proving its great value in war injuries, for it saves time, promotes recovery, and prevents infection.

Thick split grafts do best in areas with a resistant base, such as the forehead and chin. On the forehead, especially, they are useful for resurfacing the source of a flap.

Padgett's dermatome has made large intermediate grafts so easily available that they have proved valuable for the quick resurfacing of large skin defects of the neck, but the color and texture of the skin are seldom completely satisfactory, and they often do not compare favorably with the end-result of a good flap. In addition they are inclined to contract, sometimes requiring secondary grafting with full-thickness skin, especially in the central portion of the neck over the larynx and on the cheeks in the vicinity of the mouth.

The full-thickness graft is the preferred one of the free grafts for cutaneous covering on the face and for the lining of flaps. They are more difficult to apply, sometimes blistering and showing areas of necrosis in difficult regions, but with the proper technique they are employed successfully for the reconstruction of most areas of the face, notably the eyelids, eyebrows, nose, and cheeks.

Tubed and pedicled flaps are indicated where there is a loss of skin and subcutaneous tissue, when lining as well as covering must be provided for defects involving the nose, cheek, or lip, and in areas with a poor blood supply and exposed bone or cartilage.

Forehead flaps have a special usefulness in the reconstruction of nasal defects, and they are superior to any distant skin in color and texture. Although there has been a recent trend toward the substitution of split grafts for flaps on the neck in order to reduce the time of repair, this is not always advisable. From the cosmetic viewpoint the abdominal flap or the flap from the lateral chest transferred on the wrist provides a better skin covering.

LOUIS T. BYARS, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Terhune, S. R., and Camp, M. N.: Traumatic Amputation of the Finger Tips. *South. Surgeon*, 1942, 11: 646.

Traumatic amputation of the tips of the fingers is a not infrequent accident in the highly mechanized army. Most of the cases encountered in this series resulted from injuries sustained while riding in tanks over rough terrain. Roentgen examination usually revealed a transverse clean cut amputation through the terminal tuft of the distal phalanx. The field surgeon had already applied a sterile dressing without the use of antiseptics. The usual operative procedure was to avoid amputation through the distal interphalangeal joint, if possible, and to apply a split-thickness skin graft taken from the thigh. Soap and water were used to cleanse the raw end of the stump before débridement was carried out. After hemostasis the graft was applied so as not to cover any of the nail bed and sutured in place except at the dorsal margin. A vaseline gauze strip was applied over the graft and skin margins, and a firm pressure bandage was applied over this. The dressing was not disturbed until the eighth postoperative day.

The grafts remained viable in 6 of 8 cases. The final result was a minimal amount of disability. Usually the grafting was done within three hours after injury but in 2 cases late grafting was done after a period of treatment with warm saline dressings.

JOHN L. LINDQUIST, M.D.

Wilson, J. A.: Magnesium Burns—Treatment. *Indust. M.*, 1942, 2: 436.

As the burns caused by molten magnesium alloy take weeks or months to heal, they have been of considerable concern in industrial medicine. Magnesium is one of the so-called light metals, and burns resulting from magnesium are, therefore, entirely different than those resulting from iron, copper, or other metals in the heavy group. Burns from heavy metals heal quickly and in accordance with the amount of tissue killed by the heat. The following results are from the studies of the metallurgical laboratories of the International Silver Company.

Magnesium burns are often very small and form ulcers if not treated at once; over a period of several weeks they enlarge to several times the size of the original burn. The floor of the ulcer is made up of several reddish-brown granulomatous tubercles. McCord *et al.* advised wide excision of the magnesium particles if they should become accidentally embedded in the tissues as metallic magnesium inter-

feres with the normal physiology of the body cells and thereby prevents normal repair processes.

No chemical neutralizing agent could be found for the deleterious effects of magnesium in the tissues. The area of the burn is anesthetized with 2 per cent novocaine and the burned tissue is scraped away until normal tissue is obtained. With this treatment, light metal burns will heal as quickly as burns caused by the heavy metals. Untreated magnesium burns result in chronic slow-healing lesions.

Accidental burns by incendiary bombs should be treated in the same manner.

ALFRED B. LONGACRE, M.D.

Young, F.: Immediate Skin Grafting in the Treatment of Burns. *Ann. Surg.*, 1942, 116: 445.

The author quotes Mason's statement that burns should be regarded as surgical wounds and that the same principles of cleansing, débridement, hemostasis, closure, and rest be followed in their treatment. Shock in burns is, for the most part, due to fluid loss from the burned surface and into the tissues about and beneath the burn. The fluid loss causes a relative increase in blood cells and a decrease in circulating fluid and protein.

The author believes that the various methods of local treatment of burns usually used do not meet Mason's requirements. In the treatment by tanning, infection eventually supervenes in most cases. The local treatment by antiseptics does not usually prevent infection. The chief advantage of saline baths or compresses over tanning is that the third-degree areas are ordinarily ready for grafting at an earlier date.

The closed compression method originated by Koch and Mason consists of five steps. The wound is thoroughly cleansed with soap and water; loose epidermis is removed; ointment-saturated gauze strips are applied over the area; and a voluminous dressing is applied under moderate pressure and left in place from ten to fourteen days. This method of treatment is not ideal when third-degree burns are present. Dead tissue which cannot be completely removed by cleansing and superficial débridement remains as a nidus for infection and a focus for absorption.

The author presents a method of treatment which he believes to be ideal for third-degree burns. The method is applicable to burns which have occurred not more than six hours previously. One of the most important steps in this method is the recognition and treatment of shock by methods which are well known. Under anesthesia the burn is washed with soap and soft gauze for ten minutes, and the blisters and desquamated epidermis are removed from the second-degree areas. The cleansing is completed with a saline flush. Obvious third-degree areas are completely excised, and hemostasis is carefully attended to. Grafts of approximately 0.010 in. thickness are cut with the dermatone and sutured over the excised areas. The donor areas and entire burned areas are dressed with one thickness of vaselined gauze smoothly applied. In the burned area a voluminous gauze dressing is applied over the vaselined gauze and is held in place by either an Ace bandage or stockinette applied as a roller bandage. The dressing is not disturbed for fourteen days unless there are signs of infection. Adjacent joints are immobilized by the application of plaster encasement over the dressing. If the area is healed on removal of the first dressing, a second dressing of vaselined gauze, a thin layer of dry gauze, and an elastic roller bandage are applied and worn as protection for another fourteen days. Several case reports are given to illustrate the efficacy of this method of treatment.

HAROLD C. OCHSNER, M.D.

Matthews, D. N.: The Value of Local Chemotherapy in Wounds and Burns. *Lancet*, Lond., 1942, 243: 271.

The effect of sulfonamides when applied locally to various types of wounds was studied by determining the effect on the bacterial count of the exudate at daily intervals. Although there is admittedly a large experimental error in this method, the method is fairly reliable in indicating the rise or fall in the number of living organisms present.

The viable counts were made by obtaining a known quantity of the wound exudate from the same spot each day by means of a red-cell pipette. This exudate was then diluted to a known value in broth and plated out, being incubated for twenty-four hours. Care was taken to eliminate errors which irrigation of the wound might have produced. After each sample was taken the wound was dusted with sulfonamides and a dry dressing applied. A small amount of para-aminobenzoic acid was added to the culture media to insure inhibition of any of the sulfonamide which might be present in the exudate in sufficient concentration to prevent normal growth.

In every case after the local application of sulfonamides there was a prompt and often marked fall in the viable count. The amount of fall in the bacterial count varied, however, with the type of organisms with which the wound was infected. Wounds infected with the hemolytic streptococcus showed pronounced drops in the viable count. The greatest drop occurred within twenty-four hours. Usually, after twenty-four hours there was a slow but steady increase in the number of organisms present, in spite of the fact that the wound infections continued to clear up. This phenomenon suggests some acquired tolerance of the streptococcus, but the author believes that its virulence might be lessened during this process. The staphylococcus aureus showed a less violent drop in counts, and a nonhemolytic anaerobic streptococcus showed a steady unaltered count.

Chronic wounds with indolent sloughs and an unreactive appearance were usually primarily infected with the hemolytic staphylococcus and the bacillus pyocyaneus. Occasionally the bacillus coli, diphtheroid, catarrhalis, and the nonhemolytic staphylococcus were also present. The bacterial improve-

ment in these cases was greater than had been anticipated. The author regards sulfathiazole as more effective in these cases than sulfanilamide. Sulfathiazole is definitely the superior drug when applied locally in obstinate tuberculous sinuses. Sulfathiazole is also very effective against bacillus-pyocyaneus infections. Even in wounds such as result from the unroofing of a large fistula-in-ano, and in which a pure culture of the bacillus coli is found, sulfathiazole produces a fall in the bacterial count to almost zero by the fourth day.

The blood level of sulfonamides induced by local application was determined in 8 instances, the estimate being made by Marshall's colorimetric method. In all cases the peak was reached within twenty-four hours, but in no case did the blood level exceed 1 mgm. per 100 cc. after the application of 1.5 grains of the drug locally. Sulfanilamide produced higher levels than sulfathiazole, although the latter drug reached its peak level in a shorter time than the former. In these blood-level determinations the largest area from which absorption took place was approximately 7 sq. cm. in area.

The amount of sulfonamide in the urine was found to be high. For example, the urine in 1 case was found to have a concentration of 20 mgm. per 100 cc., whereas the blood level never exceeded 1 mgm. per 100 cc. It seems clear, therefore, that the kidneys have to bear high temporary concentrations of the drugs following local application. Evidence of kidney damage must consequently be watched for.

In prophylaxis the sulfonamides applied locally are of great value, but the local application must be supplemented with the drug by mouth for four days after primary suture. Hydrogen peroxide converts sulfanilamide into its oxidation products, which appear to be the active anticatalytic agents, so that this therapy of flushing out wounds with peroxide before the local application of the drug seems to be logical on chemical grounds, and certainly is successful in practice.

At a temperature of 105° F., 3 per cent of sulfanilamide is soluble in saline solution. The irrigation of wounds with this heated saturated saline-sulfanilamide solution distributes the drug evenly and deeply.

Chemicals such as eusol and the procaine group of local anesthetics have been found to antagonize the sulfonamides, and should not be used in conjunction with the local application of the latter drugs.

LUTHER H. WOLFF, M.D.

Hardin, P. C.: Cod-Liver-Oil Therapy of Wounds and Burns. *South. Surgeon*, 1942, 11: 691.

According to the author cod-liver oil is sterile and bactericidal and possesses a unique stimulating effect on granulation and epithelization. It is thought that this stimulating effect is chiefly due to its Vitamin A and D content which exerts a beneficial local and systemic action.

Cod-liver-oil ointment dressings do not cause agglutination or irritate the wound and will not harm the most delicate tissue. Three hundred and forty-six cases of wounds and burns, particularly extensive crushing or destructive injuries, such as compound fractures, gunshot wounds, and extensive ulcerations resulting from third-degree burns or other causes, were treated by means of cod-liver oil with excellent results. Satisfactory cures are also reported in 1 case of chronic undermining burrowing ulcer and 2 cases of rupture of an infected abdominal incision.

HENRY C. FALK, M.D.

Rigdon, R. H., and Stookey, P. F.: A Consideration of Therapy in Staphylococcus Infections. *Surgery*, 1942, 12: 635.

One important way in which staphylococci may effect the host is through the effect of their toxin on the parenchymatous tissues. The exotoxin produced by the staphylococci may be neutralized by specific antitoxin. It is necessary to give the antitoxin before the toxin becomes fixed to the tissues. Toxin apparently is present in more than 90 per cent of the cases of staphylococcal septicemia. It is capable of producing death or it may be only of secondary importance in the pathological processes.

The action of the chemotherapeutic agents apparently depends upon their inhibitory influence on bacterial growth. They do not neutralize staphylococcal toxin. It is difficult to determine their clinical efficiency accurately at this time.

J. M. MORA, M.D.

Caldwell, G. A., and Cox, F. J.: Gas Gangrene. Experimental Observations on the Use of the Sulfonamide Derivatives and Zinc Peroxide in Its Treatment and Prevention. *South. M. J.*, 1942, 35: 789.

By subjecting guinea pigs to conditions simulating a compound fracture, and inoculating a vegetative form of virulent strain of clostridium welchii, Caldwell and Cox were able to study various forms of treatment for gas gangrene.

Simple surgical débridement of all traumatized and devitalized muscle tissue resulted in the development of 6 cases of gangrene with 4 deaths among 20 animals. In another group, however, in which intraperitoneal sulfanilamide was introduced and the wound was closed without débridement, all of the 20 animals developed gas gangrene and died. When the wounds were left open in a third group, there were 4 survivals, and when the wounds were débrided thoroughly, there were 11 survivals.

When, however, in the fourth and fifth groups zinc-peroxide paste was introduced into the wound alone, or after débridement, respectively, definite inhibitory effects upon the development of gas gangrene were demonstrated. There were 7 survivals among 29 animals, and 3 survivals among 10 animals in these respective groups.

Sulfanilamide was then introduced locally into the wound one hour after the experimental injury, with the result that only 4 of 20 animals survived. If, however, the sulfanilamide was introduced imme-

diately after the injury, the survival rate increased to 11 of 20. This survival period was increased with débridement, even after a six-hour interval was permitted to elapse before resort to surgery. Fourteen survivals among 19 were recorded. With delay of the débridement to twelve hours after implantation of the sulfanilamide, the survival rate decreased substantially; only 2 of 19 animals lived.

Sulfadiazine with and without débridement materially improved the survival rate, and reduced the development of gas gangrene to only 4 among 20 animals. When, however, sulfathiazole was implanted immediately into the wound, only 3 cases of gangrene developed. When débridement was added to the immediate implantation of sulfathiazole with delay of the operation for six hours or more, none of the animals developed gangrene.

After correlation of the vast amount of information derived from these widely different experiments, it was observed that the intraperitoneal administration of sulfanilamide only slightly retarded the progress of gas gangrene, and was of no prophylactic value whatsoever, since it did not, of itself, prevent development of gas gangrene in a single instance. Zinc peroxide was found to definitely prolong the average death time beyond that of the control group. However, as a prophylactic agent, it was not as effective as other measures, and could not arrest the progress of the disease completely, as it acted merely as an inhibiting factor.

On comparison of the relative effectiveness of sulfanilamide, sulfathiazole, and sulfadiazine, it was shown that sulfathiazole is decidedly preferable. However, each one of the sulfonamide derivatives is an excellent means of preventing the development of gas gangrene as well as retarding its progress. The action of these derivatives is remarkable enough to warrant their use in the immediate, primary care of compound fractures. STEPHEN A. ZIEMAN, M.D.

Green, H. N., and Parkin, T.: Local Treatment of Infected Wounds with Sulfathiazole. *Lancet*, Lond., 1942, 243: 205.

The authors review certain concepts of the mode of action of the sulfonamides. In this review they point out that these drugs have a direct antibacterial action, and that their curative action is due entirely to this action and not to any indirect action on the body tissues generally. Para-aminobenzoic acid antagonizes the action of sulfonamides, and the ether-soluble antisulfonamide substance in bacteria is almost certainly para-aminobenzoic acid. The bacteriostatic effect on any species of bacteria is directly related to the capacity of the compound to block the enzyme with a substrate of para-aminobenzoic acid. Sulfanilamide, sulfapyridine, and sulfathiazole require increasing amounts of para-aminobenzoic acid to antagonize them. This proportion is roughly 1 to 5 to 50, and the ratios of the bacteriostatic potencies of the three compounds is of roughly the same order with comparatively small species variation. Consequently, sulfathiazole is the sulfonamide of choice in staphylococcal infections mainly because it is the most effective sulfonamide generally available. However, the much greater solubility of sulfanilamide (cir. 1/70) as compared with sulfathiazole (cir. 1/700) possibly wholly offsets its weaker bacteriostatic action.

On the whole, local treatment of infections with sulfonamides is advantageous because a much more effective concentration of the drug can be obtained where it is most desirable, and the danger of toxic effects is slight.

The principle objections to the local application of sulfonamides are that: (1) pus and tissue exudates have an antisulfonamide action; (2) on certain wounds sulfonamides are absorbed, particularly sulfanilamide which may be absorbed very rapidly; (3) local damage to the tissue may ensue from local application; (4) the drugs may produce resistant strains of bacteria, particularly if the treatment is intermittent or spasmodic; and (5) sulfonamides penetrate only a few millimeters in wounds, and therefore may not reach viable bacteria. In spite of these various objections, the balance of experimental evidence is strongly in favor of local treatment in localized infection, and sulfathiazole seems to be the drug of choice.

The authors list 14 cases and elaborate in some detail on the type of wound, the causative bacteria, and other factors. These cases were treated with sulfathiazole.

Infected wounds were treated, in some instances, with a drip method, which seemed to be much more effective than dusting or other methods. This drip method consisted of dripping a saturated solution (cir. 1/900) of sulfathiazole at a temperature of 110° F. upon the open wound. The treatment was given for a continuous period of from one and one-half to two hours daily at the rate of 2 drops per second from a height of not more than 4 in. After the treatment the debris and sloughs were removed and the area was covered with sulfathiazole powder. This method produced striking results in some instances.

In conclusion, the authors state that in work at the present time no other local antiseptic treatment of infected wounds should be attempted before the sulfonamides, preferably sulfathiazole, have been given an adequate trial. LUTHER H. WOLFF, M.D.

ANESTHESIA

McCarthy, K. C.: Casualty Anesthesia in England. *J. Am. M. Ass.*, 1942, 120: 599.

The author reports anesthetic methods and agents used in England in the services and by the civilian agencies in the treatment of casualties from air raids, automobile and motorcycle accidents, airplane crashes, and ordinary accidents suffered by troops in training.

In the first-aid posts diagnoses are made, temporary splints and dressings are applied, and hemorrhage is controlled. Little medical treatment is

done here. Patients are moved immediately to casualty hospitals where energetic treatment is given for shock, including warmth, shock blocks, morphine, oxygen, blood, plasma (the latter two being constantly replenished from donor centers established in most of the larger cities). After shock has been treated, emergency surgery is performed. Nitrous oxide-oxygen-ether is the most common agent used for abdominal injuries; pentothal sodium is given intravenously for the débridement of burns and wounds. Open drop ether and spinal anesthesia are contraindicated in shock cases. The surgical team of the casualty hospital comprises an attending and house surgeon, an anesthetist, 2 nurses, and 2 orderlies.

As soon as patients can be evacuated, often from two to three days after surgery, they are moved to the country to the base hospitals. Attempts are made to keep these units completely equipped for all types of cases, with emphasis placed on reconstructive surgery.

The author describes his experience during eight months as anesthetist in the American Hospital in Britain. In this hospital nitrous oxide and oxygen are piped into the operating rooms under low pressure. There are two Boyle gas machines in each operating theater, so that one anesthetist might supervise two tables should the need arise. Most machines have no carbon-dioxide absorber. Nitrous oxide is plentiful, although there is a shortage of cylinders; ethylene and cyclopropane are not supplied by the government, but the latter can be obtained. Pentothal sodium, given intravenously, is the favorite anesthetic for minor cases; nitrous oxide and ether is the most popular anesthetic for routine major surgery. Open ether, regional block, and spinal anesthesia are seldom used. Endotracheal tubes are passed in most abdominal cases, plastic cases, chest surgery (for cyclopropane), and brain cases (for tribromethanol).

Casualties from enemy action in the services and the civilian population have been far less than expected. The author states that the profession in Britain has risen to the occasion and has the situation well in hand. MARY KARP, M.D.

Papper, E. M., and Rovenstine, E. A.: The Use of Human Plasma in Spinal Anesthesia. *J. Am. M. Ass.*, 1942, 119: 1248.

The present report deals with the use of pooled human plasma as the solvent for procaine employed in spinal anesthesia. The use of plasma as a heavy solution (specific gravity 1.028) in the gravity control method for spinal anesthesia is based on the observations of Barker, who had demonstrated that duration of anesthesia is dependent on the "viscid" properties of the anesthetic mixture. Experiments on man were carried out to determine whether plasma with its high osmotic tension prolonged the anesthetic action as compared with a solution of procaine in spinal fluid. Human plasma has an average of 7.0 gm. of protein per 100 cc. as compared with 0.02 gm. in spinal fluid. It has been determined that proteins may act synergistically with local anesthetic drugs, but this fact has not been utilized for clinical anesthesia.

After studies on men who had not been operated on were completed, 10 per cent solutions of procaine in plasma were used for clinical anesthesia for 70 patients. The standard technique of administration with appropriate postural adjustments was employed to attain the desired level of anesthesia. The majority of the patients were subjected to surgical procedures in the lower part of the abdomen and lower extremities. There have been no untoward manifestations during surgical therapy or postoperatively that might be attributed to the plasma. Observations of these cases have left the impression that dose for dose the duration of procaine spinal anesthesia is prolonged when plasma rather than spinal fluid is the diluent. Predominantly, motor or sensory anesthesia can be obtained easily and as desired by appropriate adjustments of the position of the patient. MANUEL E. LICHTENSTEIN, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Wigby, P. E.: The Diagnosis of Placenta Previa by Means of the Lateral Soft-Tissue Film of the Abdomen. *Texas J. M.*, 1942, 38: 390.

The author reviews his experiences with the use of x-rays as an aid in the diagnosis of placenta previa. The technique consisted of a lateral soft-tissue film of the abdomen made with a target film distance of 40 in. without a filter, a rotating anode tube, 200 ma. seconds, and never exposed more than 4 seconds.

The author does not believe that roentgenographic exposure is harmful to the fetus or mother except perhaps in cases of gross blunders and mismanagement. In his opinion the skin tolerance of the mother is the only limiting factor.

Only 1 error in the location of the placenta was made in 66 consecutive cases of bleeding near term. In all of the other cases the site of the placenta was corroborated at the time of delivery. The appearance of actual placenta previa has not been simulated by any other condition in the author's experience. The distinction between low implantation and marginal placenta previa creates the greatest difficulty. In all such cases the addition of the air cystogram should render conclusive information concerning the presence or absence of a marginal placenta previa. JOSEPH E. FIELDS, M.D.

Young, H. McC.: The Technique of Pyelography. *South. M. J.*, 1942, 35: 895.

The author in discussing ordinary urethral irrigation, according to the method of Janet, stresses the principle of gentleness and slowness and applies it to retrograde pyelography. The entire urinary tract is provided with muscles of some sort and therefore a too rapid injection of the opaque medium leads to a sudden stretch which may provoke a sharp spastic contraction, especially in the upper portion of the tract.

Two methods have been rather widely used for the injection of fluid preparatory to the taking of pyelograms: the gravity and the syringe methods. This latter may be carried out with a syringe provided with a rubber bulb, or with an all glass piston syringe. The bulb syringe has the disadvantages that it cannot be completely filled with the irrigating fluid because of the presence of a cushion of air above the fluid level, and it cannot be relied upon to exert effective suction in case the surgeon suddenly wishes to reverse the direction of the flow. The author employs the piston syringe, the use of which is described in minute detail in the present article.

Briefly, the method consists in the use of a 10 cc. all glass piston syringe which is connected to the ureteral catheter by means of a hypodermic needle. The needle must fit very snugly into the lumen of the catheter so that there can be no leakage around it. If a No. 5 ureteral catheter is employed, it will be found that either a 20, 21, or 22 needle will fit it snugly. The surgeon starts with a measured quantity of opaque medium in his syringe, for instance, 8 cc. All air is expelled first, then the needle is fitted into the end of the catheter and the injection is done gently and very slowly, the patient's face being observed by a mere shifting of the eye. As soon as an expression of pain or anxiety is observed, the surgeon ceases his injection, the roentgenogram is made, and the skiagraphic medium is aspirated. In case of bilateral pyelography, it is wise to wait for the development of the first pyelogram, before the opposite side is examined. If there is anything suggesting extravasation or pyelovenous backflow, it is well to postpone the taking of a pyelogram on the opposite side for some later occasion. T. LEUCUTIA, M.D.

Last, S. E.: The Roentgenographic Demonstration of Hydrocele. *J. Urol.*, Balt., 1942, 48: 322.

The procedure for demonstrating hydrocele roentgenographically consists fundamentally in aspirating hydrocele fluid from the scrotal sac and replacing it with an equivalent amount of radiopaque media commonly used for intravenous pyelography, namely, neo-iopax, hippuran, diodrast, or skiodan. It was tried on fresh post-mortem specimens and in clinical cases with very satisfactory results. No substantial gross or microscopic irritative reaction was observed in these cases.

The technique used is described in detail. After the volume of fluid was estimated, about one-third of it was aspirated and replaced by the contrast medium. The hydrocele appeared as a positive and the testis as a negative shadow. The epididymis was represented by an indentation of the testicular shadow.

Several cases in which the method was used are cited and illustrated by roentgenograms. In view of the fact that the solid contents of the scrotum, especially the testis, were indirectly delineated, it is possible that the method may prove of value in the study of disease of these structures. With the present tendency and vogue to treat hydrocele by injection and obliteration, its visualization may perhaps be indicated. The method may classify the various types of hydrocele roentgenographically, that is, simple, multilocular, and congenital.

A. HARTUNG, M.D.

Kerr, H. D.: Irradiation Treatment of Cavernous Hemangioma, with Special Reference to So-Called Contact Roentgen Irradiation. *Radiology*, 1942, 39: 383.

Most writers have preferred to use radium in the treatment of cavernous hemangioma. The author has had very satisfactory results with roentgen irradiation at short distances in these lesions, and since this method is simple it seems worth while to

Fig. 1. Case 1, before and after treatment with radium plaque.

record his technique and results and compare them with the results obtained in a series of cases treated by him with radium.

This article is confined to the cavernous hemangiomas as they involve the skin or subcutaneous tissue. Brief consideration is given to the pathological and clinical aspects of such lesions and the factors influencing their treatment. Ninety-six cases treated with radium are compared with 49 cases treated solely by contact irradiation. The techniques and dosages used with both methods are described. The results are tabulated and are shown to be slightly better following the roentgen-ray treatment. Even though this was not of great significance, the author believes contact irradiation, which provides relatively soft rays which can be used at short distances to reduce the depth dose and increase the intensity, offers at least as good results as does the use of radium plaques. Flexibility and short duration of treatment are added advantages.

Three cases are cited in detail and illustrated as examples of what may be accomplished by the contact therapy method. See Figure 1 at top of page.

A. HARTUNG, M.D.

Hunter, A. F.: Roentgen Therapy of Hypertrophic Scars and Keloids. *Radiology*, 1942, 39: 400.

Clinical differentiation between keloids and hypertrophic scars is not always sharply defined, but keloids tend to progress while hypertrophic scars tend to regress. The mechanism of the formation of these lesions is a disturbance in the normal control of growth of connective tissue.

Nine hundred and thirty-one patients with keloids or hypertrophic scars treated in the Department of Radiology of the Presbyterian Hospital in New York have been studied. All were treated with roentgen therapy. The ratio of males to females was 2.5 to 1, and of white to colored patients, 1.5 to 1. The average age of the patients was 26 years. True keloid was present in 5 per cent of all colored patients and 1 per cent of all white patients.

Roentgen therapy is undertaken to make keloids or scars smaller and less conspicuous, to relieve itching and burning, to lessen contractures, and to prevent recurrence after surgical excision.

The treatment factors which have been used are 130 kv.p. and 3 mm. aluminum filter, the target skin distance and size of cone varying with the size of the

area. Two hundred roentgens are applied every two weeks for four sittings, and this is repeated after one or two months. Not more than four series are given in one year. The radiation is limited to a field from 3 to 5 mm. from the margin of the abnormal tissue by means of a tailor-made shield of lead foil. If the scar is to be excised, two treatments are given, the second a few days before operation. Immediately after removal of the stitches, a series of four treatments, as outlined, is given.

Improvement is usually slow; the first subjective evidence is relief of the itching and burning. The earliest objective evidence of resolution of a keloid is slight wrinkling of the skin over it. As it flattens and softens, it gradually looses its redness. Hyperpigmentation during the course or at the conclusion of treatment was present in 3 per cent of all patients, but was always moderate in degree and transient.

Six hundred and seventy-three of the patients treated had an adequate follow-up. Of the 588 patients treated by roentgen therapy alone, 491 noted definite shrinking of the keloid or scar, contractures were lessened in 13, spontaneous regression occurred in 8, and there was a prolonged latent period in 11. Treatment was unsuccessful in 65 patients, of whom 31 were inadequately treated. The cause of radioresistance in 34 cases could not be determined.

Eighty-five patients were treated with roentgen therapy in combination with surgery; in 10, the operability was increased, and in 6, the treatment was modified. Sixty-nine of these patients were given prophylactic roentgen therapy, and in 37 of these preoperative and postoperative treatment was deemed successful, while in 28 postoperative treatment alone was successful.

Roentgen therapy alone and in combination with surgery has been a safe, effective method of treatment resulting in flattening and softening of the scars, in improvement of function, in relief of the local symptoms, and in prophylaxis against recurrence. Failures were rare and remain unexplained.

HAROLD C. OCHSNER, M.D.

Kerr, H. D., and Cooper, W. K.: Roentgen Therapy of Pituitary Adenomas. *Am. J. Roentg.*, 1942, 48: 467.

In the ten-year period between May, 1931, and June, 1941, 41 cases of pituitary adenoma were seen. Thirty-four received roentgen therapy, while 7 received no treatment. Thirty-one were of the chromophobe type; 9 were chromophile, and 1 was basophile. Three cases were cystic. Of this group 25 which had been followed for over a year or until death are included in this report. All of the cases were treated with 200 kv., filtration of either 0.5 mm. of copper (half value layer 0.95 mm. of copper, effective wave length 0.16 A.) or Thoraeus filter (half value layer 2.0 mm. of copper, effective wave length 0.135 A.). Each of two portals was given 200 roentgens daily with the exception that only one area was treated the first day. Five portals were used and these included a frontal, vertical, occipital, and one to each temporal region. The size of the portal varied from a 5 cm. round cone to one 10 by 10 cm. A total of 1,800 roentgens was given to each of the five portals to make a total dose of 9,000 roentgens measured in air.

The 25 cases which have been studied are abstracted in some detail. Fourteen, or 56 per cent, gave excellent results; 5, or 20 per cent, good results; and 6, or 24 per cent, poor results. Those patients who had maintained improvement in their condition were considered as having excellent results; those with arrest of the disease, good results; and those with progression of the disease, poor results.

HAROLD C. OCHSNER, M.D.

Pendergrass, E. P., Hodes, P. J., and Godfrey, E. W.: The Radiation Treatment of Cerebellar Medulloblastoma; Report of 31 Cases. *Am. J. Roentg.*, 1942, 48: 476.

Medulloblastomas of the cerebellum, which usually develop from embryonic rests as central intracerebellar lesions, usually arise over the roof of the fourth ventricle. In children the lesions are usually in the midline, while in adults they may lie in one of the lateral hemispheres. The tumors, which appear to be fairly well circumscribed, invariably reveal invasion of the surrounding tissue when submitted to histological study. They are composed of rapidly growing undifferentiated cells, resembling round-cell sarcoma; mitotic figures are frequent.

Medulloblastoma frequently extends to other parts of the brain and spinal cord. The metastases are found in the pia-arachnoid of the brain and cord and in the ventricles.

The roentgen diagnostic criteria are fully considered. The authors consider that roentgen therapy is best given after decompression to avoid the possibility of irradiating another type of tumor or an inflammatory process, and because treatment then is less hazardous. Proper treatment implies irradiation of the entire cerebrospinal axis, in addition to the cerebellum.

The present surgical treatment of medulloblastoma in the Hospital of the University of Pennsylvania is limited to decompression by removal of the rim of the foramen magnum and atlas, and biopsy of the tumor. The head is irradiated from four to six weeks after operation through 5 portals, 3 cerebellar, and 2 cerebral. The cerebral portals cover and are directed into each lateral hemisphere. The suboccipital portals are centered over each cerebellar lobe and are directed through the cerebellum into the vermis and fourth ventricle. The third cerebellar portal lies over the posterior third of the top of the head, directed caudad into the posterior fossa. The target skin distance for all head and spinal areas is 50 cm. The purpose is to deliver 2,000 roentgens to each of the 5 skin areas. The spine is divided into 2 or 3 rectangular fields, each wide enough to cover the lateral margins of the vertebral bodies.

The cerebellum is treated first. On the first day 50 roentgens are delivered to 1 suboccipital portal, on

the second day 75 roentgens to another, and on the third day 100 roentgens are given over the third portal. If signs of increased intracranial pressure develop, the exposure is decreased to that which was tolerated the day previously. The dose is then increased, as tolerated, 50 roentgens per day until the patient receives 200 roentgens to one portal. Two cerebellar portals are then irradiated daily, the second starting with 50 roentgens, and the amount is then increased 50 roentgens daily until 100 roentgens are received. Thus, 2 cerebellar portals are treated alternately each day, one receiving 200 roentgens, the second receiving 100 roentgens. On the seventh day one spinal area is given 100 roentgens in addition to the cerebellar irradiation. This exposure is increased 100 roentgens daily until one spinal portal receives 300 roentgens each day. On the eighth day treatment is started over one cerebral hemisphere, and the dose is increased until one cerebral portal receives 200 roentgens in addition to the 300 roentgens over the cerebellum and 300 roentgens over the spine. This technique assures delivery of from 3,700 to 4,000 roentgens (including scatter) to the region of the fourth ventricle in patients with average sized heads. If leucopenia develops, radiation therapy is usually stopped when the total white count reaches from 2,000 to 2,500.

With the adoption of radiation therapy the average postoperative duration of life in patients with medulloblastoma approaches two or three years in selected, thoroughly treated series. The experience of the authors is that the average survival is about twenty-eight months following operation. Thus, although postoperative irradiation prolongs life, it has not succeeded in effecting cures.

HAROLD C. OCHSNER, M.D.

Schreiner, B. F., and Christy, C. J.: Results of Irradiation Treatment of Cancer of the Lip. An Analysis of 636 Cases from 1926 to 1936. *Radiology*, 1942, 39: 293.

A total of 636 consecutive cases of cancer of the lip was treated at the State Institute for the Study of Malignant Diseases of Buffalo between 1926 and 1936. These cases are analyzed in the present article from the point of view of age distribution, clinical classification, treatment, and late results.

The clinical classification includes three groups: (1) 334 cases of primary and a few recurrent cancers of the lip without demonstrable metastases, regardless of the size of the lesion; (2) 192 cases of primary or recurrent cancers of the lip associated with palpable, movable lymph nodes, some of which were suspected of being metastatic; and (3) 110 cases of primary cancers of the lip with fixed metastases of the lymph nodes, recurrent cancers of the lip with metastases, and healed primary lesions with fixed metastases in the neck.

The treatment is considered under 2 headings: (1) that of the primary cancer, and (2) that of the metastases to the regional lymph nodes.

The treatment of the primary lesion gives comparable results regardless whether surgery, radium, or x-rays are used, but with the two latter the cosmetic effect is better. The factors employed by the authors for the various types of irradiation were as follows: (a) unfiltered x-rays: 140 kv., 5 ma., H.V.L. 1.9 mm. of aluminum, 20 cm. distance, 265 roentgens per minute, dosage from 1,600 to 2,400 roentgens in one treatment; (b) radium implantation: gold seeds, 3 by 1 mm. in diameter, with 0.3 mm. of gold filter, the dosage being 1 mc. per sq. cm. or radium needles with 0.6 mm. of platinum filter, 1 or 2 mgm. per cm. length, left *in situ* for from four to seven days; (c) radium bulb: for superficial lesions, 0.1 mm. of copper filter, 1 to 2 mm. distance, dosage from 12 to 16 mc. hours; and (d) 4 gm. radium pack: 1 mm. of platinum and 1.5 mm. of steel filter with 0.5 mm. of copper and 1 mm. of aluminum secondary filter, 10 by 10 cm. field, 10 cm. distance, 50 roentgens per gram hour intensity, dosage from 3,200 to 4,800 roentgens. Of the total, 564 cases were treated by unfiltered x-rays, 49 cases by implantation of gold seeds, 11 cases by implantation of radium needles, 1 case by the radium bulb, and 11 cases by the 4 gm. radium pack.

The treatment of metastases was chiefly by external irradiation with the following agents: (a) deep x-ray therapy: 200 kv., 0.9 mm. of copper, 25 ma., 50 cm. distance, 59.6 roentgens per minute, average dose from 2,500 to 3,800 roentgens over a period of two to three weeks; (b) 4 gm. radium pack: same factors as in (d); and occasionally gold seeds or radium-needle implantation. In Group 1 only 59 cases had prophylactic irradiation with x-rays, in Groups 2 and 3 all were treated with x-rays or with the radium pack. In 36 cases radon seeds or radium needles were employed in addition to the external irradiation treatment.

The following results were obtained in the various groups:

1. Absolute cure rate of 69.5 per cent. If those who died from intercurrent disease or were lost to observation after the local lesion was healed in from two to five years are eliminated, the relative cure rate was 93.9 per cent. 2. Absolute cure rate of 68.2 per cent and relative cure rate of 85.0 per cent.
3. Absolute cure rate of 10.9 per cent.

For all of the cases the absolute cure rate was 58.9 per cent and the relative cure rate 74.4 per cent.

T. LEUCUTIA, M.D.

Traut, H. F.: Uses and Abuses of Radiation Therapy in Obstetrics and Gynecology. *Am. J. Obst.*, 1942, 44: 638.

Excepting in the rare instances of malignant disease of the genital tract, it is extremely seldom that a justifiable gynecological indication for the therapeutic use of radiation therapy can be found in young women under twenty years of age.

In dealing with the gynecological patient of reproductive age, the physician must always form his judgments with regard to the use of therapeutic agents, being guided by a sensitive appreciation of

the importance of preserving the procreative function. The treatment of carcinoma of the cervix constitutes the greatest use which can be made of radiation during the reproductive period of life.

As the menopause is approached, that is, in women forty or more years of age, the indications for the use of radium and x-rays in the treatment of benign conditions increase.

The treatment of pruritus of the vulva and anal region should be mentioned, not only because of the frequency of these ailments at the menopause and afterward, but to point out that the use of even the most superficial x-ray treatments to this region is not wise except perhaps in such small amounts as 75 roentgens for five treatments, for while they may give relief of the discomfort, they frequently are followed at a later time by abnormal skin changes closely analogous to kraurosis.

Carcinoma of the vulva should never be treated by any form of radiation therapy.

It is a great mistake to conclude that *all* patients with inoperable or recurrent cancer should receive radiation therapy, for often more harm than good results therefrom.

Radiation therapy is very often a blessing, but it may also be a curse. Its use must be guided by clinical discretion and extensive knowledge of neoplastic and benign disease processes. The enthusiasm of radiation specialists is essential to the development of the art of radiation therapy; however, the application must be held within the bounds deemed suitable by conservative clinicians, whose experience and long range point of view, in conjunction with the opinion of the radiologist, should dictate its use and decide upon appropriate application. The mere treatment of well established or hopeless malignant processes by radiation and all other means is but to beg the question as far as the responsibilities and capabilities of the profession are concerned.

Great advances will be realized when there is a thorough and capable application of the prophylactic idea. Genital cancer can then be treated in its incipiency rather than in its advanced stages.

EDWARD L. CORNELL, M.D.

Orndoff, B. H.: Roentgen Therapy in the Management of Some Nonmalignant Diseases Affecting the Organs of the Female Pelvis. *Radiology*, 1942, 39: 127.

Endometrial hyperplasia, endometriomas, and myofibromas constitute a rather closely related group of tissue changes the origin of which depends upon a common factor (estrin). They are encountered with increasing frequency in gynecological practice.

Endometrial hyperplasia is characterized by disturbances of the menstrual flow and the presence of glandular cystic hyperplasia of the endometrium. These changes appear to be a result of the absence of progesterol and the action of estrone. Endometriosis, characterized by the appearance of endometrioid tissues in ectopic locations is of two types. One is characterized by a down-growth of the epithelium into the myometrium, or the occurrence of islands of endometrial epithelium and stroma interspersed among bundles of smooth muscle tissue, entirely separated from the true endometrium. In the second type of endometriosis, endometrioid tissue is found in the ovaries, the oviducts, or on the pelvic or visceral peritoneum. Myofibromas are really leioyomas; they are the result of a physiological disturbance, with hyperestrinism as the most important factor.

The diagnosis of these conditions is dependent to a considerable extent upon the history. Diagnostic investigation should almost invariably include fluoroscopic and film studies after the introduction of contrast material into the uterine cavity. The character of the defect in the endometrium as seen in x-ray studies offers important data for differential diagnosis.

These various conditions might be prevented by the promotion of conception and childbearing. The author believes that mature women (over twenty-three years of age) should marry as early as possible, and if contraception is to be practiced, it should be withheld until at least the fourth decade of life has been reached. In the therapeutic management of these cases the judicious use of ergot, stypticin, extract of the pituitary and suprarenal glands, calcium, rest in bed, and the application of ice bags, intrauterine and vaginal packing, and blood transfusions should not be neglected. Surgical procedures which do not create an artificial menopause are justified. Such procedures are careful cervical dilatation with perforated sounds and the excision of polyps and other diseased tissues in the cervical canal and endometrium. Electrosurgical methods should be employed almost exclusively. In a small proportion of cases the removal of pedunculated fibroids and those which impinge upon the normal birth canal is justified. Some clinical investigators believe that normal sexual qualities are better preserved when permanent interruption of menstruation has been obtained through irradiation rather than by the removal of the pelvic organs. In cases of endometriomas, the surgical procedure must include removal of all ovarian tissue.

In sterilization by radiation therapy, the author believes that 300 roentgens delivered into the pelvis are required at the beginning of the fourth decade. When radium is employed, about 500 mgm. hr. must be delivered to the endometrium. When pronounced action upon the endometrium and myometrium is desired, at least 1,000 roentgens should be given into the pelvis, followed by radium 1,000 mgm. hr. within the endometrial cavity and the cervical canal.

HAROLD C. OCHSNER, M.D.

Buschke, F., and Cantril, S. T.: Roentgen Therapy of Carcinoma of the Urinary Bladder. An Analysis of 52 Patients Treated with 800 Kv. Roentgen Therapy. *J. Urol.*, Balt., 1942, 48: 368.

Analysis of the 52 cases of urinary-bladder carcinoma treated with 800 kv. roentgen therapy, which form the basis for this article, yielded information

which the authors believe may be of value in determining the indications, contraindications, and possibilities of this type of treatment and which may be useful as a working basis for present clinical decisions and for further study. The results obtained in all of the cases are tabulated.

Seven of 52 patients treated are well as disclosed by cystoscopic examination, 5 of them for more than five years and 1 each for more than one and two years, respectively. All of the 7 patients had papillary noninfiltrating carcinomas. Their case histories are cited in detail together with the technique and dosage of irradiation given to each of them.

The uncontrolled cases are grouped according to the presumable reason for the failure into 5 main groups: (1) biological type of tumor unsuitable for roentgen therapy; (2) technical errors in cases which otherwise might have been curable lesions; (3) extensive disease; (4) general condition of the patient; and (5) complications due to previous therapy of any kind. Each of these groups is discussed, and case histories exemplifying them and general data influencing the results are given.

In their summary the authors state that extensive papillary growths in which infiltration cannot be demonstrated are the most suitable cases for roentgen therapy. If roentgen therapy is chosen it should not be requested as a last resort at a time when the conditions for its success have been considerably lessened by infiltration, a poor general condition, or associated infection. Infiltration of the tumor into the bladder muscle prevented sterilization by irradiation. A good general condition, adequate drainage and adequate capacity of the bladder, and absence of marked infection are prerequisites for a fair trial by this method. A previous suprapubic operation, particularly in the presence of any obstruction or infection, is an additional hazard to intense irradiation.

A. HARTUNG, M.D.

Slaughter, D. P.: Radiation Osteitis and Fractures Following Irradiation, with a Report of 5 Cases of Fractured Clavicle. *Am. J. Roentg.*, 1942, 48: 201.

It is the purpose of this paper to review the effect of irradiation on bone and to illustrate it by clinical observations. The effects are dependent on such variables as dosage, manner in which the radiation is administered, and anatomical peculiarity of the blood supply of any given bone. The pathology of radiation reaction is described at length. It is entirely one of degree and may end anywhere between the extremes of complete recovery or necrobiosis. Damage to the blood supply inhibits repair, and the slow progression of such a process may produce aseptic necrosis years after the original radiation injury. Infection superimposed on osteoradionecrosis is another factor complicating irradiation effects.

Clinical situations in which radiation to bone may produce complications that must be considered in planning the treatment include: (1) when treatment is given over a growing bone, particularly over the epiphysis; (2) when the bone is liable to infection, as in the mandible, or in the skull when a deeply ulcerating tumor of the scalp is being treated; (3) when the bone is close to the surface, as in the phalanges, metacarpals, skull, or clavicles; (4) when weight-bearing is necessary and the blood supply is not guarded by an extra margin of safety, as in the femoral neck. Fractures may occur in weight-bearing bones, particularly in the femur and femoral neck, and may also occur in nonweight-bearing bones, even when they are not subjected to unusual stress and strain.

Clinical data and case reports are presented illustrating untoward results in connection with patients treated for various conditions in which the factors mentioned had a bearing on the results obtained. Interference with growth capacity, radionecrosis and osteomyelitis, and fracture of various bones are among the conditions given consideration.

A. HARTUNG, M.D.

RADIUM

Reinhard, M. C., Goltz, H. L., and Schreiner, B. F.: A Study of Radiological Treatment of Cancer of the Cervix. *Radiology*, 1942, 39: 144.

Five hundred and fifty-seven cases of cancer of the cervix in clinical Groups I, II, and III, treated from 1931 to 1935, inclusive, are reviewed. The study was undertaken to associate the end-results of the radiation therapy with the dosage.

It was found that 457 cases fell into two distinct groups on the basis of treatment technique. These cases all received primary irradiation administered over a period not exceeding four days. This method, to which the author refers as primary irradiation, consists of (a) one or two small doses of 200 kv. x-rays, with a half-value layer of 0.9 mm. of copper, delivered anteriorly and posteriorly through 20 by 20 cm. ports of entry at a target-skin distance of 80 cm; and (b) insertion of radium tubes of from 100 to 200 mgm. radium content, with 1.0 mm. of platinum and 1.0 mm. of steel filtration in the cervix and palpable part of the tumor.

Two hundred and thirty of the 457 cases received supplementary irradiation consisting of protracted irradiation either from radium packs, 200 kv. x-rays, radium tubes and seeds, or any combination of these.

The survival of the patients receiving primary irradiation only is much higher than the survival of those receiving a supplementary course at a later date. Those patients who were treated with supplementary radiation at some period following the primary treatment fell into a younger age group; but a better survival is associated with the groups in which the tumor occurred at a more advanced age.

Isodose and dosage distribution curves are presented. Doses at the 2 cm. mark at a range between 4,000 and 8,000 roentgens of primary radiation only, were capable of producing a 75 per cent five-year survival free from disease in patients belonging to Groups I and II, and a 55 per cent five-year survival

free from disease in the patients belonging to Group III. Among the patients in all three groups who received supplemental irradiation, the highest survival was associated with doses less than 2,000 roentgens in addition to a full course of primary irradiation.

HAROLD C. OCHSNER, M.D.

MISCELLANEOUS

Miley, G.: Ultraviolet Blood Irradiation Therapy (Knott Technique) in Acute Pyogenic Infections. *Am. J. Surg.*, 1942, 57: 493.

During the past three years the author used ultraviolet blood irradiation according to the modified method of Knott in 151 unselected cases of acute pyogenic infections.

The method consists of withdrawing and citrating a predetermined amount of the patient's blood, passing it through the hemoirradiator for ultraviolet irradiation, and returning it immediately by the intravenous route to the patient. In its latest form, the hemoirradiator has 3 essential parts: (1) a modified Knott irradiation chamber, (2) an automatic transfusion pump, and (3) a water-cooled, mercury-quartz burner. The automatic transfusion pump permits passage of the blood through the Knott chamber at any desired rate, so that the irradiation dosage is carefully controlled.

In the clinical application of the method, 3 important factors must be considered:

1. The amount of blood withdrawn and irradiated. This is calculated from the formula A = KW, where A is the amount in cubic centimeters of the blood to be withdrawn (rarely exceeding 300), K is constant (1.5 in this work), and W is the weight expressed in pounds.

2. The time of exposure of ultraviolet energy. This is the time required for the passage of 1 cc. of blood through the Knott chamber, which on an average is ten seconds.

3. The wave length of the ultraviolet rays used and their corresponding intensity. These are shown in the following table:

Wave Lengths Angstrom Units	Intensities mW/cm.²
2,399	55,000
2,483	88,000
2,536	273,000
2,652	239,000
2,753	86,000
2,804	139,000
2,897	96,000
2,967	224,000
3,022	435,000
3,125–32	718,000
3,342	73,000
3,473	41,000
3,650–54	1,538,000

A tabulation of the results revealed the recovery of 100 per cent in the 35 early, of 98 per cent in the 61 moderately advanced, and of 42 per cent in the 55 apparently moribund (55 per cent nonsepticemia, 19 per cent septicemia) cases. Other beneficial physiological effects, such as a bactericidal effect, vasodilatation, and a venous oxygen increase, were observed. In no instance was there any harmful effect on the blood itself, on kidney function, or on any other body function.

The abstracts of 4 typical case histories are included to illustrate the method of procedure as well as the immediate response to the therapy. A photograph and description of the apparatus is also given.

The conclusions are drawn that the method is valuable for controlling acute pyogenic infections rapidly and efficiently. The earlier it is applied, the better the result. It is essentially a hospital procedure for the present. T. LEUCUTIA, M.D.

Paterson, E.: A Comparison of the Action of X and Gamma Radiation on Fibroblasts. *Brit. J. Radiol.*, 1942, 15: 257, 302.

The author presents the results of experiments carried out over a period of several years on the relative effectiveness of x and gamma rays on fibroblasts *in vitro*.

The cultures were prepared from fibroblasts of the chorioid and sclerotic layer of the chick eye, after eight or nine days of incubation, by the hanging-drop method. Each culture was laid on the coverslip in a minute drop of dilute embryonic extract, spread until flat, and then media, consisting of equal parts hen plasma and dilute embryonic extract, were added. The preparation, after sealing, was incubated at between 37° and 38° C.

The irradiation was carried out through the lid of a wooden box in which the temperature was kept at 37° C. The coverslips were mounted on hollow ground glass slides which were arranged concentrically on a cork platform within the box. The x-ray factors were: a continuously evacuated Metropolitan-Vickers deep therapy tube, operating at 230 kv. const.; 1 mm. of copper plus 1 mm. of aluminum filters; 1.6 mm. of copper H.V.L.; 0.12 A° wave length; and a dosage rate of 53.6 roentgens per minute at the plane of the cultures. For the radium irradiation the preparation was sandwiched between two plaques, each of which contained 9, 25 mgm. tubes of radium element with 1 mm. of platinum filtration. The arrangement was such that a homogeneous area of radiation 1.0 by 0.6 cm. was obtained at the level of the cultures. The dosage was calculated on the basis of 8.4 roentgens per hour, being the dosage rate at 1 cm. from a point source of 1 mgm. of radium filtered by 0.5 mm. of platinum. It amounted to 53.6 roentgens per minute at the plane of the cultures. Since the x-ray dosage was measured by a Victoreen instrument and checked against a Hammer dosimeter, it was always possible, by changing the distance of the x-ray tube, to bring the x-ray-dosage rate up to that calculated for the radium. Hence the dosage rate and the over-all time of irradiation for each pair of experiments was always the same.

The effect of the irradiation was estimated by studying the death rate and mean life of the cultures.

If 48 hours after a subcultivation either no cells or not more than 3 cells could be seen protruding from the explant, the culture was considered as dead. The percentage of cultures which had died in each group during the period covering 20 subcultivations (forty days) from the time of initial irradiation was taken as the death rate and the average number of subcultivations that a group of cultures survived from the time of initial irradiation was taken as the average life period.

The results which were tabularly arranged showed that in each pair of experiments with fibroblast cultures grown on glass, the x-rays were more lethal and were followed by a shorter mean survival time than the gamma rays.

In the second part of this article an account of further experiments is given. An attempt was made to explain why x-rays are more lethal than gamma rays on fibroblast cultures grown on glass when the dose and dosage rate are equal. The question was raised whether or not the inequality of effect of the two radiations might be due simply to secondary electron emission from the silicon (atomic No. 14) in the glass coverslips, the average atomic number of which is approximately 11. This influence of coverslip material was investigated in 2 series of experiments: (a) by the use of coverslips containing elements of high atomic number (gold, lead, glass), and (b) by the use of coverslips containing only elements of low atomic number (polystyrene derivations, paraffin). All of these experiments are described in minute detail. However, because of war conditions, it became impossible to complete the series of experiments on the effects of gamma rays on light substances. The number of cultures used with the x-rays on light substances was also, relatively, too small to permit absolutely rigid conclusions.

Nevertheless, the author feels justified to advance the following explanation concerning the variation of the x-ray and gamma-ray effects on fibroblastic cultures as a whole. The experiments have shown that even when one test material was used throughout and the same technique of radiation employed, different results could be obtained which depended on the nature of the substances in close proximity to the cells. X-rays were apparently more lethal than gamma-rays when cultures were irradiated on glass and on gold, yet no significant differences were found between the x-rays and gamma-rays when the cultures were irradiated on "distrene" and paraffin. There was definite evidence that the effect of the x-rays was decreased when cultures were irradiated on light materials in contrast with materials containing atoms of medium or of high atomic number. On the other hand, in the incomplete experiments, there was an apparent increase in the effect of the gamma-rays when "distrene" and paraffin were used, compared with the effect on glass.

All in all, the experimental evidence supports the belief that with dosage assessed in roentgens, observed differences between the effects of x-rays and gamma-rays may be in part due to the variation in the secondary electron emission of the substances in contact with the cultures. T. LEUCUTIA, M.D.

Osgood, E. E., Aebersold, P. C., Erf, L. A., and Packham, E. A.: Studies of the Effects of 1,000,000 Volt Roentgen Rays, 200 Kilovolt Roentgen Rays, Radioactive Phosphorus, and Neutron Rays by the Marrow Culture Technique. *Am. J. M. Sc.*, 1942, 204: 372.

The experiments described in this article were carried out partly in the Division of Experimental Medicine of the University of Oregon Medical School and partly at the W. H. Crocker Radiation Laboratory of the University of California.

In each experiment about 10 cc. of human marrow obtained by sternal puncture were introduced into a 50 cc. vaccine vial containing 25 cc. of citrated, balanced salt solution. After manipulation to eliminate most of the non-nucleated erythrocytes, the final culture contained about 100,000,000 nucleated marrow cells suspended in about 50 cc. of medium consisting of about 35 per cent of human umbilical-cord serum obtained from the fetal side of the placenta and 65 per cent of balanced salt solution similar in composition to cerebrospinal fluid. This was thoroughly mixed, and after removal of a sample for initial total and differential cell counts, equal volumes were placed in each of 4 to 6 vaccine vials. All manipulations were made with the syringe and needle through 70 per cent alcohol on the vaccine vial caps. The vials containing the identical cultures were then sent by Air Express from Portland to the W. H. Crocker Radiation Laboratory, University of California, in Berkeley, where the cultures were treated with neutron rays, 1,000,000 volt roentgen rays, 200 kv. roentgen rays, or radioactive phosphorus, 1 vial always being left untreated as a control. The vials were then returned by Air Express, placed in the incubator at 37°C., and at intervals samples were removed for total and differential cell counts. The medium was changed every twenty-four to forty-eight hours. In some experiments identical vials of cultures were kept in Portland at room temperature or in the pocket of one of the investigators as an additional control.

The factors of the irradiation were as follows:

1. For 1,000 kv. roentgen rays: 2 mm. of lead filter, 9 mm. of copper HVL., 80 cm. target distance, 20 r/min., total dose 200 roentgens.

2. For 200 kv. roentgen rays: (a) 200 kv. constant, 0.2 mm. of tin and 0.25 mm. of copper added filter, 1, 4 mm. of copper HVL, 80 cm. target distance, 15 r/min., (b) 220 kv. peak, 2 mm. of copper added filter, 2.3 mm. of copper HVL., 60 cm. target distance, 15 ma., 31 r/min., dose 400 roentgens for 1 vial of each culture and 60 roentgens for another

3. For neutron rays: 60 in. cyclotron by bombarding beryllium with 16,000,000 volt deuterons and collimating the neutron beam to 10 by 15 copper field at 100 cm. from the target, 3 cm. of lead filter to suppress gamma rays, dose 50 n in one series and 15 n in the other.

4. For radioactive phosphorus: prepared with the 60 in. cyclotron and introduced into the vials in the form of disodium phosphate, Na_2HPO_4. The radioactive phosphorus gives out only beta rays (no gamma or alpha rays), whose maximum energy is about 1,700,000 electron volts. The activity (measured with a Lauritsen electroscope) was calculated so that an average of 1 microcurie uniformly distributed through 1 cc. of culture should produce the same ionization in a twenty-four-hour period as an exposure to 35 roentgens of roentgen rays. The total dose was taken as the activity corresponding to 400 roentgens of roentgen rays. An equal volume of the same concentration of nonradioactive disodium phosphate was introduced into the control vial at the same time. On return of the cultures about twenty-four hours after irradiation the vials were centrifuged and the medium replaced with fresh radioactive phosphorus-free medium.

The cell studies included total and differential counts made for each vial at twenty-four, forty-eight, seventy-two, ninety-six, and one hundred and twenty hours after the culture was placed in the incubator. Graphs were plotted and numerous curves drawn. The following general conclusions were reached:

An exposure to 200 roentgens of 200 kv. roentgen rays had similar effects as to an exposure to 200 roentgens of 1,000 kv. roentgen rays or 50 n of neutron rays on lymphocytes. An exposure to 15 n of neutron rays had similar effects on both lymphocytes and progranulocytes as an exposure to 60 roentgens and 400 roentgens, respectively, of 220 kv. roentgen rays. The exposure ratio, $\frac{r}{n}$, for lymphocytes and progranulocytes in marrow cultures is approximately 4. One microcurie average of radioactive phosphorus distributed through 1 cc. of human marrow culture acting for a period of twenty-four hours has an effect similar to 35 roentgens of high-voltage roentgen rays on lymphocytes and progranulocytes. These effects and the straight-line character of the drop may all be explained if the major action of the ionizing radiation is to inhibit the onset of mitotic and amitotic division of the cells receiving the irradiation. T. LEUCUTIA, M.D.

Marinelli, L. D., and Goldschmidt, B.: The Concentration of P_{32} in Some Superficial Tissues of Living Patients. *Radiology*, 1942, 39: 454.

The authors studied the turnover and elimination of radiophosphorus (P_{32}) by measuring its concentration in the superficial tissues of living patients by means of a modified Geiger-Mueller counter which is described and diagramatically illustrated in the text. Three cases were used for this purpose, 1 of melanoma and 2 of mycosis fungoides.

Although the incompleteness of the experiments imposes certain restrictions, it was found that the normal skin overlying osseous structures, such as that covering the dorsum of the feet or hands, exhibits a radioactivity which is from 1.7 to 1.8 times that of the normal skin overlying soft tissues, such as that on the chest wall and thighs. The activity of the malignant neoplasms was in all cases many times that of the skin and was sharply limited to the involved areas. In the case of melanoma the activity of the skin metastases increased with progress of the disease. In the 2 cases of mycosis fungoides the activity remained unchanged during the entire period of observation, although the initial concentrate and rate of elimination varied individually.

These observations are interesting since they open up new fields of investigation. Further studies by more direct means of approach, such as radioautographs of skin specimens at planes perpendicular to the surface and assays of P_{32} concentration in different layers parallel to the epidermis, are necessary before fixed conclusions can be drawn.

T. LEUCUTIA, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Rafsky, H. A., and Newman, B.: Cholesterol Studies in the Aged. *J. Lab. Clin. M.*, 1942, 27: 1563.

The total cholesterol and cholesterol partition were studied by means of the Bloor and Knudson method, in a group of 150 so-called normal aged persons. In this group were 76 males with a mean age of seventy-seven and one-tenth years, and 74 females with a mean age of seventy-six and two-tenths years. All of the individuals were ambulatory and on a normal institutional diet. The determinations were made after a fasting period of at least eight hours.

Of the 100 persons in whom the whole blood was studied, 57 per cent had a total cholesterol concentration of more than 200 mgm. per 100 cc., and 68 per cent showed free cholesterol of more than 40 per cent. Of the 50 persons in whom serum was used, 74 per cent had a total cholesterol concentration of over 200 mgm. per 100 cc., and 54 per cent had an excess of 40 per cent free cholesterol.

WALTER H. NADLER, M.D.

Foltz, E. E., Ivy, A. C., and Barborka, C. J.: The Influence of Components of the Vitamin B Complex on Recovery from Fatigue. *J. Lab. Clin. M.*, 1942, 27: 1396.

It is generally conceded that one of the cardinal symptoms of thiamine deficiency is easy fatigability. It is reported that in patients suffering from thiamine deficiency the blood pyruvate is elevated and administration of thiamine causes it to become lower. Muscular exercise produces a rise in the blood pyruvate level above that found at rest. Further, thiamine-deficient patients develop a higher level of pyruvic acid in the blood after exercise than do normal persons and are capable of less work. Some investigators have believed that the administration of thiamine and other components of the Vitamin B complex allayed fatigue. For these reasons, an attempt was made to ascertain whether recovery could be hastened by giving thiamine and other members of the Vitamin B complex to fatigued persons.

Double work periods were used. The subjects would work to fatigue on a bicycle ergometer, the end point being their inability to maintain a rate of 1,235 kc. per minute with a pedaling rate of 54 R.P.M. Immediately after this work period the vitamin to be tested was injected intravenously. Ten minutes after the cessation of the first work period each subject would again work to fatigue.

The authors conclude that thiamine, cocarboxylase, riboflavin, and Vitamin B complex given intravenously have no immediate influence on recovery from voluntary muscular fatigue in subjects receiving "adequate" nutrition. The double-work-period method of studying fatigue enables the investigator to determine whether his subjects are actually working to a designated end-point of fatigue. The percentage of recovery is less variable than the first-period work output, the second-period work output, or the total work output in initially untrained subjects.

J. M. MORA, M.D.

Peterson, O. L., and Finland, M.: The Effect of Food and Alkali on the Absorption and Excretion of Sulfonamide Drugs After Oral and Duodenal Administration. *Am. J. M. Sc.*, 1942, 204: 581.

Sulfanilamide is absorbed very rapidly and completely when it is given orally or into the duodenum. Food delays absorption of the drug but does not diminish the amount excreted in the urine.

Sulfapyridine, sulfathiazole, and sulfadiazine are poorly absorbed from the duodenum.

Sulfadiazine is absorbed more slowly but more completely when it is given after a meal than if it is given on a fasting stomach. Alkali appears to increase the amount of drug absorbed when it is given with sulfadiazine after a meal. Sodium-bicarbonate hastens the absorption of sulfadiazine when given on an empty stomach, but does not increase the amount absorbed. Sodium sulfadiazine is rapidly absorbed from the duodenum or after oral administration in a fasting subject. Absorption is delayed and is less complete if it is given after a meal.

WALTER H. NADLER, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Simson, F. W., and Barnetson, J.: Histoplasmosis. Report of a Case. *J. Path. Bact.*, Lond., 1942, 54: 299.

Histoplasmosis as a clinical entity is characterized by emaciation, fever, and enlargement of the lymph nodes, liver, and spleen. In addition, in most instances, the bone marrow is affected, with resulting anemia and leucopenia. In reticuloendothelial cells, in lesions in the lungs, liver, spleen, and intestines, an organism was seen which was round or oval in shape, with a definite refractile periphery, to which the name histoplasma capsulatum was originally given. Later, the similarity between histoplasma capsulatum and the cryptococcus farciminosus was established—both being fungi.

The reaction to the presence of the organism is a reticuloendothelial proliferation in the liver, lungs, spleen, lymphoid tissue, bone marrow, and subepithelial tissue. These organs and tissues may not be uniformly affected. One or more in an individual may be grossly affected, others slightly, or apparently not at all. Among the reported cases there were more males than females, and there was no apparent racial predilection, and no age preference.

Histoplasmosis is a chronic intractable disease, and has almost invariably proved fatal. Except in 2 instances, chemotherapy and radiotherapy have been of no value. Among the therapeutic agents used are antimony, and arsenical and iodine preparations.

The organism was isolated from the tissues of the living subject in the case reported, and was successfully cultivated at room temperature on artificial media in its mycelial form. SAMUEL KAHN, M.D.

Welch, H., Slocum, G. G., and Durrett, J. J.: The Production of Tetanus by Implantation of Pellets Contaminated with Tetanus Spores. *J. Am. M. Ass.*, 1942, 119: 1396.

Because the administration of crystalline hormones by the subcutaneous implantation of compressed tablets or pellets as introduced by Deanesly and Parks appears to be an established clinical procedure, the authors undertook to study the possibility of disease production if such pellets were contaminated by tetanus spores. In their study they used U. S. P. cholesterol contaminated by varying numbers of tetanus spores which had been washed free of toxin and heated to kill vegetative forms. Guinea pigs were the experimental animals. The authors also tried the effect of various antiseptics, including sulfathiazole, in inhibiting tetanus when it was introduced in pellets containing tetanus spores. They found that tetanus spores introduced with such pellets caused the disease in the majority of the animals. Introduction of small amounts of staphylococci at the site of the inoculation shortened the incubation period and caused an increase in the number of experimental animals which succumbed.

The authors decided, as a result of their studies, that the addition of antiseptics to prevent the development of tetanus appears to be futile. Pellets should be sterilized during their preparation by effective filtration or other processes, handled aseptically throughout their manufacture, and controlled by an adequate check on their sterility. The implantation should be under rigid asepsis.

MARIAN BARNES, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Dawson, E. K., and Harvey, W. F.: Macro- and Micro-Diagnosis of Cancer. A Laboratory Survey of Routine Mammary Lesions. *Edinburgh M. J.*, 1942, 49: 401.

As the chief interest in this survey was the correlation of the macroscopic and microscopic diagnosis of the material, the record-containing clinical data was deliberately not consulted until the material had been cut into and examined by the naked eye, and a diagnosis had been made and recorded. During the course of the routine examination of 274 breast cases, the authors were impressed by the obviousness of the cancerous growth to sight and touch. The same method of examination is available at the operating table, so that the experienced surgeon is seldom in doubt as to the diagnosis in mammary lesions, and very rarely finds it necessary to perform a two-stage operation.

The high degree of accuracy of diagnosis by sight and touch in mammary carcinoma by the experienced surgeon and the pathologist indicates that rapid diagnosis by means of a frozen section or by staining the surface of an excised section of tissue adds little, if any, certainty in breast cases. The diagnostic frozen section is, however, a useful procedure which permits the surgeon to operate on a particular day, to allay the fear of a patient, or to help shorten the period of hospitalization. When the diagnosis is really doubtful and frozen sections have been made, it is still advisable to proceed with paraffin sections.

The correlation of the macroscopic and microscopic aspects of mammary lesions has shown that the pathologist can make a very accurate diagnosis as to whether the tumor is malignant, benign, or non-neoplastic, from the examination by sight and touch of a single plane of section across the operative material.

The authors approve the following surgical procedure:

A preliminary, sufficient incision is made radially from the nipple across and into the tumor so that it may be seen and felt. If it is a tense cyst and not a carcinoma, it will be obvious. If it is of the nature of a pure intracanalicular carcinoma, "carcinoma in situ," that will also usually be obvious. If the diagnosis is not obvious, a simple mastectomy is probably advisable in any case, and if for any reason this is contraindicated, the surgeon can await the biopsy report on a quick paraffin section. There seems to be little clinical or statistical basis for the fear that diagnostic biopsy of a tumor before actual excision causes dissemination of the tumor cells.

JOSEPH K. NARAT, M.D

Hueper, W. C.: Morphological Aspects of Experimental Actinic and Arsenic Carcinomas in the Skin of Rats. *Cancer Res.*, 1942, 2: 551.

Epidermal neoplasms of the human skin vary greatly in their degree of differentiation and in the type of special organic morphology which they reproduce. However, this diversity in structure is apparently unrelated to the physical or chemical nature of the causative carcinogenic agent. Thus, epidermoid carcinomas as well as basal-cell cancers are elicited by the action of arsenicals and solar radiation containing ultraviolet rays. Similar conditions seem to apply to animals.

The author's study on the morphological aspects of experimental actinic and arsenic carcinomas in the skin of rats is presented to emphasize the structural diversity of the various epithelial tumors produced by these carcinogenic agents, and to add at the same time several new types of epidermal neoplasms hitherto not described in irradiated rats.

The evidence presented is satisfactory proof that under proper stimulation (ultraviolet rays, arsenic) the epidermis of the rat is capable of producing as

great a variety of carcinomas as that seen in the human skin. The carcinomas obtained in the skin of rats following an exposure to ultraviolet rays are even more complex than those occurring in man, as they are not infrequently associated with hyperplastic or sarcomatous proliferations of the mesenchymatous elements of the cutis, complications rare in tumors of the human skin. The great variety of epithelial tumors and their frequent coexistence with mesenchymatous neoplasms observed in these animals are attributable to some extent to the fact that the skin of the rat is much thinner and less cornified than the human skin, so that the ultraviolet rays can penetrate deeper into the subepidermal tissue and elicit blastomatous responses both from the appendages of the skin and from the mesenchymal tissues.

However, the occurrence of tumors differing widely in structure, yet located side by side in the skin of the exposed animals, indicates that the diversity depends not entirely upon the action of the carcinogenic agent, but is determined and modified in its degree and depth by the thickness of the keratin and cellular layer and by the density and distribution of pigmentation and hairs. The type of photochemical changes elicited in the skin seems to play a major rôle in this respect. These, in turn, seem to depend upon endogenous factors of metabolic nature and are responsible for the kind of pathological "internal environment" produced in the irradiated tissue, and therefore provide a certain steering mechanism in the carcinogenic process.

Although arsenical epidermal cancer in man has appeared in the form of cancroid, mixed basal and squamous-cell carcinoma, basal-cell cancer, and Bowen's dyskeratosis, the few experimental arsenic carcinomas produced in mice or rabbits have all been squamous-cell carcinomas.

The average life span of the rat is apparently shorter in general than the latent period of experimental arsenic carcinoma. JOSEPH K. NARAT, M.D.

EXPERIMENTAL SURGERY

Wilson, H., and Rigdon, R. H.: Capillary Permeability and Inflammation in the Skin of Rabbits. Experimental Studies Following Sectioning of the Spinal Cord. *Arch. Surg.*, 1942, 45: 416.

Capillary permeability and inflammation in the skin of the rabbit have been studied by means of the application of xylene to the shaven skin of the animal at intervals preceding the intravenous injection of trypan blue. A definite pattern of localization of dye occurred in the xylene-treated areas. This dye localized first and in the largest quantity in the area where the xylene had been present the shortest length of time before the dye was injected.

The problem of capillary permeability and inflammation has been studied also by the intradermal injection of various irritants and, thereafter, removal of the tissues at various intervals for microscopic study.

Variations in the normal pattern of the localization of trypan blue and an inhibition of localization of leucocytes induced by the application of xylene have been noted in animals (1) narcotized with ether and alcohol; (2) given large doses of epinephrine; (3) sick as a result of a severe staphylococcus septicemia, and (4) suffering from a profound lowering of the blood pressure following hemorrhage.

Since the tone of the blood vessels is affected to a definite degree by sympathetic impulses transmitted through the spinal cord, and since the vascular reaction is of such importance in the mechanism of inflammation, it was decided to study this reaction in the skin of the rabbits following the sectioning of the spinal cord. The results of the experimental investigation indicate that the skin of the rabbit fails to show hyperemia and edema following the local application of xylene when the cervical portion of the spinal cord is cut, if the animal is also in shock. Trypan blue fails to localize and to concentrate in the xylene-treated areas of the skin of rabbits when they are in shock. Polymorphonuclear leucocytes, also, do not concentrate in areas of skin injected with either staphylococci or aleuronat when the spinal cord is cut and the animals are in shock. The sectioning of the spinal cord in the rabbit apparently has no direct effect on the development of the local inflammatory reaction, provided the animals are not in shock as the result of the sectioning of the cord.

MANUEL E. LICHTENSTEIN, M.D.

Phemister, D. B., and Schachter, R. J.: Neurogenic Shock. *Ann. Surg.*, 1942, 116: 610.

During the last ten years, considerable importance has been attached to shock, and experiments of almost all kinds have been carried out. However, the experiments that had to do with the nervous factors involved in shock have not been conclusive. Most of the experimental work connected with the nervous system in shock has been related to injury of the sensory nerves or a traumatised field. Although such stimuli do lower the blood pressure and produce shock, a low pressure level cannot be maintained by this means. Psychological activity incident to trauma is known to play a part, and some of these activities have been investigated.

As the carotid sinus and the cardioaortic nerves have a special effect on the blood pressure, continuous stimulation of the carotid sinus was adopted as a means of maintaining a low blood pressure in the dog. The article describes in detail the experimental method which ultimately turned out to be a method of producing cannula electrode stimulation. A bipolar cannula electrode was tied in the common carotid artery, the distal pole being carried into the first portion of the internal carotid artery and the proximal pole resting in the carotid sinus. The common carotid artery was tied and divided proximally, and the soft parts were retracted with self-retaining retractors.

In one group of experiments in which the blood pressure was held continuously below 70 mm. of

mercury, the blood became concentrated and death occurred after eight and one-half hours. In the second set of experiments in which the blood pressure was lowered by stimulation but remained above 70 mm. of mercury, there was relatively little damage to the circulation for many hours. Finally, the blood pressure in the last group fell to shock levels and death then followed in 45, with the survival period varying nineteen hours.

The fact that stimulation of the sinus causes death is shown by the control animals, which lived on an average of twenty-eight and seven tenths hours, or nine hours longer than those in the second group. These died mainly from the anesthesia and from infection. As the author states, although this is really neurogenic shock, the experiments indicate only a bearing on human shock as those conditions would scarcely arise in the human being.

ADRIEN VERBRUGGHEN, M.D.

Coman, D. R.: Human Neoplasms in Tissue Culture. *Cancer Research*, 1942, 2: 618.

The tissue-culture method has been successfully applied to the study of human neoplasms only in recent times. Since the earlier attempts much progress has been made, and it has become apparent that the cultivation of human neoplasms offers no obstacles not also encountered in the cultivation of neoplasms of the lower animals. The origination of the roller-tube method of tissue culture by Gey has made possible the maintenance of more massive cultures over extended periods.

Various human neoplasms have been cultured by the author by the roller-tube method and their patterns of growth have been described and photographed. These tumors included carcinomas, sarcomas, and various benign growths.

Benign glandular epithelial tumors formed acini after a month of culture, whereas malignant epithelial tumors never formed acini. A squamous-cell carcinoma produced structures *in vitro* resembling epithelial pearls.

Individual neoplastic epithelial cells frequently broke away from the cell clusters and displayed ameboid movement. Such isolated cells sometimes gave rise to new colonies. The possible significance of this in relation to the mechanism of invasion and metastasis is mentioned by the author.

Lymphosarcomas produced lymphoblasts in 2 instances and only macrophages in a third. This suggested a possible heterogenicity in the histogenesis of the lymphoblastomas. An angiosarcoma formed endothelial tubes *in vitro*. These structures resembled vessels and produced lateral branches.

Some neoplasms that presented a similar appearance in histological sections behaved differently *in vitro*. These differences were noted both in the neoplastic cells and also in the stroma cells.

The feasibility of the roller-tube method for the study of a wide variety of living human neoplasms is demonstrated and its value in investigative oncology is emphasized. JOSEPH K. NARAT, M.D.

Greene, H. S. N.: Heterologous Transplantation of a Human Fibrosarcoma. *Cancer Research*, 1942, 2: 649.

Several years ago it was found that rabbit cancers could be transferred readily to animals of alien species by utilizing the anterior chamber of the eye as an inoculation site. The ease with which such transfers were effected suggested that the same technique might be applied to the heterologous transplantation of human tumors. Accordingly, a series of transplantation experiments was undertaken and, at the present time, a considerable number of human carcinomas have been successfully transferred to guinea pigs and rabbits.

In general, the major interest in such transfers has been centered on a study of the factors which permit the breakdown of species barriers and allow growth in the alien host, but in 1 instance attention was directed particularly to the character of the tumor growth in the foreign species.

The tumor selected for this study was a fibrosarcoma derived from the breast of a young woman. It was transplanted three hours after operation on March 7, 1940, and has now been carried by serial anterior-chamber transfer in the guinea pig for more than two years. In addition, transplantation to the guinea pig's testicle has been successfully effected.

The author reports the results of transplantation experiments and describes the growth characteristics of the tumor. J. M. MORA, M.D.

HOSPITALS; MEDICAL EDUCATION AND HISTORY

No author: The Medical Schools after Three Years of War. *Brit. M. J.*, 1942, 2: 289.

Arrangements for the new session of the various medical schools in London, the provinces, and in Scotland after three years of war, are described. In general the volume of teaching has not been lessened, nor has the standard been lowered. So far as the preclinical subjects are concerned, several of the London Schools are returning to London after three years' experience in the Provinces.

The increased emphasis on the aspects of preventive, social, and industrial medicine, and the shortening of the time devoted to the clinical period are creating some difficulties for the schools. However, to the outside observer, at least, it seems that the schools are equal to all trials and emergencies.

WALTER H. NADLER, M.D.

Webb-Johnson, Sir A.: Address to London School of Medicine for Women. *Brit. M. J.*, 1942, 2: 165.

All physicians are now of one great army, concerned no longer with the place of women or the preserves of men, but with the practice of medicine and the war against disease. The position of women as an essential part of the medical profession was only attained by the selfsacrificing effort of pioneers. The rise of women on the stage and in art and in letters is traced.

The outstanding pioneer was Elizabeth Fry who succeeded in obtaining shelter for the homeless, and libraries for Naval hospitals. It was but a step to Florence Nightingale, and then to women's fight to enter the medical profession. Medical women and Florence Nightingale are credited with having done more than any others of their sex to bring about the new conception of the place of women in society and to carry to a successful issue the movement for the general emancipation of women.

The pioneers in women's fight to enter the medical profession in England were Elizabeth Garrett, and Sophia Jex-Blake who in 1874 was largely responsible for the founding of the London School of Medicine for Women. It was not until 1909 that diplomas of the Royal College of Surgeons were granted to women, and until 1926 that full rights were obtained. War has seemed to give women their greatest opportunities for proving their worth. Florence Nightingale found her opportunity in wartime. Again, in 1914, war brought a big opportunity. In the present war women have taken an honored place by acknowledged right.

WALTER H. NADLER, M.D.

Anderson, D. P., Jr.: The Fate of the Major Surgical Case in the Small Hospital. *Minnesota M.*, 1942, 24: 720.

The author, quoting the Journal of the American Medical Association, states that about 27 per cent of active general hospital beds in the United States are located in hospitals of 100 bed capacity or less. In Minnesota, 39 per cent are in this group. His report of the quantity and quality of major surgery done in this group is of interest to the profession in general, and to organizations doing much to elevate surgical standards in particular.

In the St. Olaf Hospital, Austin, Minnesota, 785 major surgical operations were performed during the six-year period ending March 1, 1942. Four men, 3 general surgeons qualified by the American Board of Surgery and 1 general practitioner who limits his work to emergency cases, did all the surgery.

A general survey of their results in 785 major surgical procedures showed a 3.9 per cent hospital mortality.

There were 333 nonperforative appendectomies without a death.

The mortalities during this six-year period were as follows:

8.6 per cent in 35 cases of perforative appendicitis

6.9 per cent in 29 cases of acute small-bowel obstruction

4.8 per cent in 62 cases of gall-bladder and biliary-tract operation

2.3 per cent in 43 cases of total or subtotal hysterectomy

13.6 per cent in 22 cases of major surgical procedure for the radical cure of cancer

27 per cent in 18 cases of major procedure for the diagnosis and palliative treatment of malignancy

A survey has been made of the major surgical cases treated by members of the Austin Clinic in order to give a general idea of the scope of surgery in a small community. Austin has a population of approximately 21,000, with smaller towns and rural districts within a radius of 35 miles.

MATHIAS J. SEIFERT, M.D.

German, W. McK.: A Pathologist Sees Colombia. *Ohio M. J.*, 1942, 38: 841.

The author, sent to Bogota by the Division of Cultural Relations of the Department of State to conduct, in Spanish, a postgraduate course in pathological anatomy and histopathology, presents an interesting description of Colombia which, although a friendly neighbor to the United States and almost bordering on the Panama Canal, is relatively little known to most of us. In this land of extremes of climate, people, and culture, social progress has been so accelerated that some parts of the country have been unable to keep up. A true democratic spirit has long flourished. Lying so near to the equator the climate stays practically the same and one must go up or down to get a change.

The Medical School of the National University of Bogota has about 1,000 students because of the fact that limitation is opposed. Tuition fees follow a sliding scale based on the income of the student's family. Front page newspaper advertising is considered ethical and seems to have the advantage of almost running quacks out of print. Medical practice is handicapped by the lack of professionally trained nurses and of internes. A small training school for nurses has been set up largely through the efforts of the Colombian Red Cross, and since Colombian girls are breaking away from rigid customs and entering the various professional schools there is hope for nursing. Other handicaps are the anesthesia problem, including the effect of altitude and the lack of central heating. The country has every kind of disease that goes with such extremes as the hot jungle and high, cold tableland. Oroya fever lurks in some of the Andes valleys, typhus occurs, and leprosy is common.

The flea is everywhere, intestinal parasites are no less a hazard, and amebic and bacillary dysentery occur. In fact, fleas, intestinal parasites, and mosquitoes seem to be Colombia's worst enemies. In the lowlands malaria is the constant plague, often the malignant tertian form now known to be carried also by the jungle mosquito and probably by several other varieties. The center of yellow-fever control is the Rockefeller Foundation. A viscerotomy by means of a special instrument plunged into the liver is a legal requirement in every acute febrile death of less than ten days' duration. In some districts a curious brand of rabies flourishes; it appears in pack mules and burros, rarely in men or dogs, and is transmitted by large vampire bats. Incidentally, at the time of the author's visit, there were but 2 qualified pathologists in the whole country.

WALTER H. NADLER, M.D.

Hunter, R. J.: The First Flight Surgeon. *Mil. Surgeon*, 1942, 91: 349.

This article offers an interesting retrospective study on aviation medicine by Robert J. Hunter, the first Flight Surgeon. In it he gives a short personal history. Aviation medicine was brought to life when Major Lyster met Isaac H. Jones at the Union League in 1918. At that time the term "Flight Surgeon" had not yet been coined. In a letter Jones asked Hunter if he would like to be a medical advisor to be responsible for the physical fitness of each flyer. Hunter accepted the offer and was then "Flight Surgeon." This was during the first World War, early in 1918. In telling of the new duties of his office he presents an interesting comparison of the status of aviation medicine then and now.

Aviation medicine has vastly changed since Hunter first became a Flight Surgeon. Wonderful advances have been made and with them have arisen a host of intricate research problems. Notwithstanding these advances in aviation medicine, certain basic principles remain the same.

Hunter states that the Flight Surgeon must be a man well versed in all the basic sciences, although he cannot, of course, be a specialist in otology, ophthalmology, physics, physiology, and psychology. All of these sciences afford problems which urgently need to be solved in aviation medicine. It is the Flight Surgeon's duty to watch the flying personnel for any evidence of deterioration. It is necessary to re-examine the men constantly to check up on their physical fitness and to eliminate those unfit for flying. The Flight Surgeon should have the assistance of at least 3 or 4 specialists, such as eye specialists, specialists in cardiovascular and respiratory diseases, as well as in psychology. In wartime it is essential that examinations be carried out more frequently than in peacetime because of (1) the stress of service conditions, and (2) the fact that rapid expansion of the air force will produce a personnel which does not have the stability, either in health or thorough flying experience, that is to be found in a smaller group observed over a longer period in peacetime.

Hunter deems it essential that the Flight Surgeon be a man who has the confidence of the flyers. They should feel that he is there to protect them, and he should have a small enough personnel under his care to be able to mix with them and meet them on a personal basis. In order to meet these requirements, the Flight Surgeon should be a sympathetic individual of the family practitioner type. Hunter cites instances to prove his point that if the flying personnel have easy access to the Flight Surgeon many dangerous conditions will come to his attention which would not otherwise be noticed.

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